THE UNIVERSITY OF ALBERTA

PERSONALITY CORRELATES OF COGNITIVE STYLES

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA

MAY, 1968

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled PERSONALITY CORRELATES OF COGNITIVE STYLES, submitted by Nicholas William Phillips in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

ABSTRACT

Measures of the cognitive styles (i) extensiveness of scanning, and (ii) category width were interpreted to be presentations of ambiguous, threatening, risk-involving task situations which provided a minimal set of cues for decision-making. Certain classes of individuals encountering such tasks should respond in a manner consistent with reducing the uncertainty perceived. An attempt was made to relate consistencies in the above cognitive styles to several personality dimensions -- specifically, manifest anxiety, social defensiveness, rigidity-flexibility, and intolerance of ambiguity. Interrelationships were also examined among extensiveness of scanning, category width, and selectiveness of attention deployment (field-articulation). Sixty-two males and eighty females were group tested on all measures except extensiveness of scanning. A simulated Size Estimation Test was administered individually to derive several scanning measures. The data were intercorrelated and subjected to multiple linear regression analysis to test the following hypotheses: (i) anxiety, social defensiveness, rigidity-flexibility, and intolerance of ambiguity are significant predictors in accounting for the variation in extensiveness of scanning and category width, (ii) extensiveness of scanning and category width are negatively related, (iii) field-articulation and extensiveness of scanning are negatively related, and (iv) field-articulation and category width are positively related. The data yielded the following results: (i) the given personality dimensions were significant predictors in accounting for variation in extensiveness of scanning, (ii) these personality dimensions did not contribute significantly to

the variability of category width for the male or female samples, (iii) however, certain classes of high-low dichotomized groups on the personality measures did relate significantly to category width in the predicted direction, thus supporting the uncertainty reduction assumption, (iv) individuals characterized as high on anxiety, social defensiveness, rigid, and intolerant of ambiguity scored as high scanners and narrow categorizers; conversely, individuals defined as low anxious, low social defensive, flexible, and tolerant of ambiguity scored as low scanners and broad categorizers, (v) relationships between extensiveness of scanning and category width were only partially confirmed, (vi) field-articulation was not related to all scanning measures; high field-articulating males devoted less time centrating on standard; high field-articulating females made fewer constant errors, (vii) only high field-articulating females were shown to be broad categorizers. The discussion attempted to explain consistencies in cognitive styles to be, at least partially, a function of particular personality dimensions.

ACKNOWLEDGMENTS

Completion of this thesis involved the generous and interested efforts of many individuals. Dr. S. Hunka has devoted valued time in detailed evaluation of several drafts including the final copy. A particular note of gratitude is expressed to Dr. C. M. Christensen for his time and suggestions in organizing this draft. Dr. C. C. Anderson on several occasions offered vital references which assisted in guiding my thinking in the area. Mr. D. Flathman assisted in computer programming and statistical interpretation.

From the early stages of this thesis, through the many successes and failures, my wife Amy has shared both joys and frustrations with me. In typing and moral support, her efforts have been efficient and cherished.

TABLE OF CONTENTS

PAGE

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

FIGURE PAGE

PERSONALITY CORRELATES OF COGNITIVE STYLES

Introduction

The traditional "stimulus-response" orientation to the study of perception is being replaced by a dynamic decision-making model (Gregory, 1964) involving an active individual processing information.

> Perceiving is a cognitive process involving knowing, understanding, comprehending, organizing, even cognizing. Most of our current research on the topic would suggest that perceiving is responding, naming, discriminating, and analyzing. These psychological processes all exist, and it does not matter that they are also called perception. What does matter is that we study perception as a cognitive process. As such, perception is much more closely related to classification, conceptualization, and free-recall learning than to sensory or discriminatory processes . . . The perceiver does not passively receive information about his environment, rather he actively perceives his environment. Nor does he simply impose his organization on an otherwise unstructured world -- the world is structured. But he does select the structure to which he will attend and react, and he even provides the missing structure on occasion (Garner, 1966).

Indeed, considerable evidence has been compiled to demonstrate that individuals manifest a cognitive "style," a characteristic and consistent set of strategies for processing an array of events, experiences, and expectations encountered in one's everyday world. The individual uses a typical style for receiving, adapting to, and processing information which must be assimilated with an accumulation of past experiences, and accommodated to situational and motivational demands.

Category Width as a Cognitive Style

The concept of category width or sometimes referred to as "breadth of category" or "courseness-fineness of category" (Fillenbaum,

1959), attempts to define the range of stimuli and the range of attributes for given stimuli which will be included as similar or different in the categorization process. Different operational tasks have been used by various investigators and studies designed to establish significant relationships between these scores have been, to date, rather disappointing and discouraging.

Tajfel, Richardson, and Everstine (1964) have reviewed the nature of various categorization tasks. An outline is presented in Table 1. They argue that since the various experimental tasks involve different aspects of behavior -- i.e., conceptual, judgmental or perceptual, there is reason to suspect that different cognitive processes may be invoked. Furthermore, there is reason to hypothesize that cognitive processes of categorization may be functioning along several different dimensions depending upon the given experimental task. Hence, the lack of workable relationships across tests of categorization becomes less surprising. Considerable controversy has been generated regarding validity and dimensionality of tests (Bruner and Tajfel, 1965a, 1965b; Gardner and Schoen, 1962; Gardner and Schoen, 1965). It is conceivable, for example, that individuals may reveal breadth of categorization across different, as yet unspecified, conceptual realms (cf., Kagan *et al.*, 1963; Gardner and Schoen, 1962).

Kogan and Wallach (1964) have gathered empirical support to suggest that a particular categorization proclivity reveals some attitudes toward risk taking in females. Narrow categorizers expressed a preference for errors of exclusion whereas broad categorizers preferred to make

TABLE 1

METHODS OF MEASURING THE CATEGORIZATION PROCESS

Operational Definition	Authors
1. Geometric figures to be included or excluded in a prescribed criterion class	Wallach & Caron (1959 Bruner & Tajfel (1961)
2. Free sorting tasks -- common objects, photos of human figures, samples of behavior	Gardner (1953) Gardner *et al*. (1959) Gardner & Schoen (1962) Messick & Kogan (1963) Kagan *et al*. (1963)
3. Judgment of geometric figures belonging to set of criterion classes	Fillenbaum (1959)
4. Verbally presented tasks involving decisions of conceptual span (breadth)	Pettigrew (1958) Fillenbaum (1959)
5. Tests of conceptual span comparing attributes of stimuli with audio-visual apparatus	Bruner & Rodrigues (cf., Bruner, Goodnow, & Austin, 1956)

errors of inclusion. They argue that the former tendency reveals a decision commitment of greater psychological value than the latter. Their data indicated that low test anxious - high defensive females were _not_ revealing expressions of categorization but rather strategies for _uncertainty reduction_. A preference for broad categorization (or making errors of inclusion) suggested a course of conceptual conservatism in responding to the particular experimental situation. No such distinctions were found for males suggesting that risk taking attitudes were not involved in the categorization task.

A more recent summary in this area (Wallach and Kogan, 1965) is outlined here:

1. The Category Width Test (CWT, Pettigrew, 1958) is structurally similar to that of Wallach and Caron (1959), Bruner and Tajfel (1961), Tajfel, Richardson, and Everstine (1964), and Fillenbaum's (1959) Range Width Task.
2. The Wallach and Caron scores were significantly and positively correlated with the CWT.
3. Little support has been presented to suggest that the category width and equivalence range measures (Gardner _et al._, 1959; Clayton and Jackson, 1961) are tapping a similar cognitive process.
4. The CWT is free of acquiescence and criticalness response styles. Acquiescence denotes a preference of inclusion of stimuli patterns as members of a target category. Criticalness refers to a tendency toward exclusion of stimuli patterns with a target category unless one is more or less certain of an adequate correspondence.

5. Data gathered by Wallach and Kogan do not support a contention that category width and equivalence range measures tap the same underlying construct of categorization.

Interest in the concept of category width has generated considerable research. Peculiarities in categorization have been consistently reported. Males prefer broad categorization, while females choose narrow categorization. One explanation (Gardner and Schoen, 1962) suggests that in a test like Pettigrew's CWT, females may appear as narrow categorizers due to their greater inhibitions regarding quantitative thinking. However, this author believes that it is too sweeping a generalization to claim sex differences on such grounds alone. An examination of our pilot data has shown regularly that while female mean scores are lower than male mean scores, there is a marked <u>overlap</u> of scores. Many females reveal CWT scores equal to, or even greater than the mean male score. Similarly, many male scores are as low as the mean female CWT score.

The process of categorization has generated interest since it is believed to have contributed a new dimension to cognitive functioning. According to Bruner and Tajfel (1961), four distinct trends of research have developed:

(a) the investigation of changes in breadth of category as a function of changes in categorizing conditions.

(b) the study of individual consistencies in breadth of categorizing in different judging situations.

(c) the search for relationships between various emotional and

personality factors and the individual's general preference for broad or narrow classifications.

(d) the exploration of relationships between breadth of categorizing and various forms of abnormal mental functioning.

The present investigation was directed toward the third trend cited above.

Perceptual Variables as Cognitive Styles

Individual consistencies have also been revealed using perceptual tasks. The work of Witkin, Dyk, Faterson, Goodenough, and Karp (1962) supports the cognitive style of "field dependence-independence."

> An analytical, in contrast to global, way of perceiving entails a tendency to experience items as discrete from their backgrounds, and reflects ability to overcome the influence of an embedding context. People differ in the extent to which their perception is analytical. This dimension of individual differences has been called field-dependence-independence. A tendency toward an analytical or global way of perceiving characterizes a person's perception in a wide variety of situations, making for marked individual self-consistency.

Working independently, Kagan, Moss, and Sigel (1963), using a variety of conceptual tasks, have reported a related cognitive style.

> There are additional classes of variables [i.e., besides differentiation and abstraction,] however, that deserve attention in descriptions of cognitive activity. One of these classes has acquired the title of 'cognitive style,' a term that refers to stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment. One particular style dimension involves the tendency to analyze and to differentiate the stimulus environment in contrast to categorizations that are based on the stimulus-as-a-whole.

Finally, Gardner, Holzman, Klein, Linton, and Spence (1959) initiated a series of studies which led to the isolation of what they

termed "cognitive control principles." These have been defined by them as follows:

> Cognitive controls are conceived as slow-changing, developmentally stabilized structures: (a) they are relatively invariant over a given class of situations and intentions; (b) they are operative despite the shifts in situational and behavioral contexts typical of cognitive activity from moment to moment. Cognitive controls refer to a level of organization that is more general than the specific structural components underlying perceptual, recall, and judgment. The invariant which defines a control has to do with the manner of coordination between a class of adaptive intentions and a class of environmental situations. They are the individual's means of programming the properties, relations and constraints of events and objects in such a way as to provide an adaptively adequate resolution of the intentions which brought him into an encounter with reality (Gardner *et al*., 1959).

Several cognitive control principles have been reported by Gardner *et al*. (Tables 2 and 3). Of particular interest for our purposes are field-articulation and extensiveness of scanning.

Field-Articulation: This control principle is closely related to the variable described by Witkin *et al*., and Kagan *et al*. It refers to generalized individual differences in selectiveness of attention. Field-independent or high field-articulating individuals show an ability to inhibit irrelevant compelling stimuli while imposing various forms of order or structure in the given stimulus field of a perceptual task.

Extensiveness of Scanning: Individuals have shown consistent differences in extent of attention deployment. This phenomenon has been referred to by Gardner *et al*. as extensiveness of scanning. In a size estimation task, where individuals were required to match a comparison

TABLE 2

CONTROL PRINCIPLES DERIVED FOR MALE SAMPLE*

Rotated Factors	Amount of Variance Accounted for	Control Principle
Factor I	12.3%	Scanning
Factor II	7.2%	Not interpreted
Factor III	6.7%	Not interpreted
Factor IV	7.5%	Tolerance for Unrealistic Experiences
Factor V	5.9%	Not interpreted

Total variance accounted for = 39.6%

N = 30

TABLE 3

CONTROL PRINCIPLES DERIVED FOR FEMALE SAMPLE*

Rotated Factors	Amount of Variance Accounted for	Control Principle
Factor I	15.3%	Field-Articulation
Factor II	11.7%	Leveling-Sharpening
Factor III	6.8%	Equivalence Range
Factor IV	5.9%	Not interpreted
Factor V	8.2%	Not interpreted
Factor VI	8.2%	Not interpreted

Total variance accounted for = 56.1%

N = 30

* Gardner et al. (1959), pp. 155-158.

stimulus with a standard, Gardner and Long (1962a, 1962b) have demonstrated that:

1. Extensiveness of scanning (i.e. centrations relatively balanced between standard stimulus and comparison stimulus) is negatively related to constant errors of estimation.
2. There are consistent individual differences in extensiveness of scanning.
3. Extensiveness of scanning and selectiveness of attention (field-articulation) are independent cognitive control principles.
4. Various response inhibition tendencies are related to extensiveness of scanning, which suggests that this control principle may have motivational connotations in a given situation.
5. The extensive scanner is concerned with the "veridicality, exactness, and acceptability of his response," while the limited scanner seems far less preoccupied with such problems.

Several studies have been reported (Silverman, Davids, and Andrews, 1963; Zaslow, 1950; Silverman, 1964) which attempt to show how measurement of cognitive styles (i.e., extensiveness of scanning, category width or conceptual span, and selectiveness of attention deployment) may prove useful for diagnostic purposes.

<u>Personality Variables and Cognitive Styles</u>

Consistencies in cognitive styles have been related to personality dimensions. Bruner and Tajfel (1961) point out (a) that the act of categorization carries risk-taking implications, and (b) certain

personality characteristics have been associated with consistencies of categorization. Individuals found to be obsessive, anxious, and uncertain prefer narrow categorization in making sensory judgments. Bruner and Tajfel suggest that such individuals adopt this strategy to minimize the risk of encountering threatening stimuli.

An analysis of extensive scanners (Klein, 1958) gained through projective testing has revealed them to behave as follows:

> The dominant impression was one of intense intellectualizing tendencies, pervasive experiences of ambivalence, mistrust, expectation of being hurt. They regarded the world as a source of malevolence and danger, and had a generally pessimistic outlook on the present and the future. They seemed preocuppied with issues of mastery, and they were intensely self-absorbed (e.g., they made an unusually large number of references to body parts on the Rorschach). They felt guilty, dissatisfied with their achievements and their contacts with objects and people were darkened by aggression. At the same time they were intensely absorbed in the rejecting and threatening world of people and things (pp. 111-112).

If categorization and extensiveness of scanning have risk-taking implications to certain individuals, there is reason to seek further relationships between these cognitive styles and personality variables.

Measurement of breadth of categorization and extensiveness of scanning were interpreted in this study as being open-ended task situations offering a minimal set of useful cues for decision-making. If this interpretation is correct, certain classes of individuals presented with such tasks should react in a consistent manner designed to reduce cognitive uncertainty. An attempt was made here to isolate these individuals on the basis of the following personality characteristics -- anxiety, social defensiveness, intolerance of ambiguity, and behavioral rigidity.

Purpose of the Study

A large volume of evidence has been compiled showing consistent individual differences in breadth of categorization. In studies using the Pettigrew Category Width Test (CWT) males are reported as broad categorizers and females as narrow categorizers. Explanations of this phenomenon have referred to the female's greater inhibitions toward dealing with quantitative stimuli. Others have argued that consistencies in breadth of categorization are a function of strategies assumed to ward off cognitive uncertainty. Finally, a suggestion has been offered that categorizing style in females is related to motivational dispositions. No such relationship has been posited for males.

The purpose of this study was to show how given personality dimensions were associated with breadth of categorization. Individuals isolated as anxious, intolerant of ambiguity, socially defensive, and rigid should, whether male or female, react in a conservative manner, that is, score as narrow categorizers.

The cognitive styles -- extensiveness of scanning and selectiveness of attention deployment (field-articulation) -- should also be related to breadth of categorization. The typical manner in which classes of individuals attend to stimuli should have some effect on breadth of categorization, since they manifest a particular strategy of processing information.

The hypotheses tested, then, were the following:

1. Anxiety, social defensiveness, rigidity-flexibility, and intolerance of ambiguity are significant predictors of extensiveness of scanning.

2. If extensiveness of scanning expresses cognitive uncertainty, the relationship between extensiveness of scanning and category width should be negative. Field-articulation scores should also relate negatively with category width.
3. Individuals characterized as high on anxiety, social defensiveness, rigidity, and intolerance of ambiguity are unwilling to risk broad categorization, but prefer to accept mean values on the CWT (narrow categorization).
4. Individuals free of excessive anxiety, social defensiveness, rigidity, and intolerance of ambiguity are broad categorizers.

Method of Analysis

Multiple linear regression analysis was used as outlined in Bottenberg and Ward (1963, pp. 52-57). While this technique remains a univariate method of analysis, the researcher has at hand a more flexible approach to experimental design. Analysis of variance models require the researcher to fit his data into a prescribed experimental model. With this requisite he must attend to troublesome details of "matching experimental subjects" and "equating cell frequencies" (Bottenberg and Ward, 1963). To deviate from standard models also increases the need for "adjustment" formulations. The assumptions underlying multiple linear regression analysis are essentially similar to assumptions involved in analysis of variance.

The classical analysis of variance is used to test the significance of the differences between means of a number of different samples. Central to the analysis of variance technique <u>and</u> the regression analysis

model is the feature of additivity of effects (of a known source) to account for the variance of all observations. In regression analysis, the method of least squares is used to derive constants which maximize the correlation between the predicted criterion scores and the observed criterion scores. These constants are equivalent to means derived in a given cell in the analysis of variance model. Squared multiple correlations (R^2) are proportions of variances accounted for by the predictors in the model. Thus, a test of significance in regression analysis incorporates a ratio of variance proportions, which is identical to a ratio of variances in the classical analysis of variance. Depending on the models compared in regression analysis, one can test for row effects, column effects, interaction and error. Any partitioning of sums of squares in analysis of variance can be achieved by comparing appropriate models in regression analysis.

Different sets of full and restricted models were tested using the $\underline{F}$ statistic (Bottenberg and Ward, pp. 124-125) to determine the acceptance or rejection of a number of hypotheses. Depending on the psychological questions incorporated in the studies, certain questions could be answered:

(a) Does the inclusion or exclusion of given predictor variables contribute any statistically significant difference to account for the variance in the criterion (dependent) variable?

(b) Which predictor variable accounts for the greatest amount of variance in the criterion variable? What other predictor variable or variables contribute significantly to the criterion scores?

(c) Are there any interaction effects and among which variables?

The IBM 7040 computer was used for all analyses. Tests for significance were at the .05 to .01 level. A number of differences were reported at the $.10 \geqq \underline{p} \geqq .05$ level since some relationships were worthy of notice. Results of the regression analysis are reported in detail (Appendix A) in tabular form.

In the event that no statistically significant differences were found, the data were dichotomized into "high" and "low" groups on all the personality measures. Subjects scoring above the mean were classified as "high" while those scoring below the mean value were classified as "low." This method of dichotomization was adopted to permit new sample groupings large enough for meaningful analyses. The frequently used technique of examining data in upper and lower quartiles would have resulted in too few subjects in each group. Thus, results derived from the former method of subclassification would lead one to make conservative interpretations where more significant relationships may have existed.

The correlational model does not, of course, state a causal relationship among variables. However, the present state of development in the area of cognitive styles is largely exemplified by a search for <u>what</u> are the variables involved, as well as how they are related. Experimental variable modulation, with an eye to cause-effect relationships can later be attempted once the search yields <u>which</u> variables we are to modulate. Cross-validation techniques provide ultimately the best assurance that the given set of isolated variables

will "perform" in a predicted relationship.

Cognitive Style Measures

1. *Breadth of Categorization* (*Category Width Test*): The rationale underlying this test was derived largely from Bruner and Rodrigues (cf., Bruner, Goodnow, and Austin, 1956). Their procedures were converted into a paper-and-pencil test requiring subjects to respond to various estimation tasks (Pettigrew, 1958; Harper *et al*., 1964, pp. 460-471). Each item presents a mean value of a stimulus category or class, and the subject is to choose upper and lower limits of that stimulus category from empirically determined alternatives. Criterion validity (i.e., against Bruner and Rodrigues' methods) is reported at $r = .57$ ($p \leq .01$).

2. *Field-Articulation* (*Designs Test*): The Greek letter capital sigma is embedded somewhere in each of 300 complex designs presented in rows of ten. The subject is asked to check off as many designs as he can containing the sigma letter in a time limit of two minutes. The score consists of the number of designs correctly marked. Correlations with Witkin's *Embedded Figures Test* vary. Gardner *et al*. (1960) report an $r = -.29$ ($p \leq .05$, one-tailed test), using a female sample.

3. *Extensiveness of Scanning*: Apparatus (Wine, 1965) was designed to simulate Gardner's (1959) *Size Estimation Test I*. The major difference was that *squares* were used as standard and comparison stimuli rather than circles. Two sections of lightweight black poster paper were cut into right-angled "∨" shapes and diagonally fitted

into the apparatus so that a rod and pulley system could pull them apart, thus making the square larger, or bring them together making the square smaller. This mechanism was stationed directly behind a square framed $4\frac{1}{4}$" by $4\frac{1}{4}$" ground glass screen. Manipulation of square size was achieved by turning a $3\frac{1}{2}$" knob. Illumination of the variable square was derived by two incandescent 40 watt tube bulbs stationed behind the "V" mechanism in a reflector box. The variable square surface appeared uniform in density and edge definition remained excellent from 0 to 100 millimeters range in square size. A scale with pointer permitted the experimenter to read off subjects' estimation sizes behind the apparatus. Pre-experiment testing showed little error between scale readings and actual measurement of the variable square. Largest error ranges were from 0.00 to 0.50 millimeters per trial. These errors remained constant for all subjects.

A Lafayette pen recorder was manually operated by the experimenter. The gear box in the recorder operated a paper roll at the rate of six inches per minute. Distances of pen deflections were converted to a time scale and subsequent tabulations yielded the following measures:

(a) Total estimation time from beginning to end per trial.

(b) Number of centrations on the standard square per estimation trial.

(c) Total centration time on the standard square per trial.

(d) Percentage of centration time on standard square over variable square.

(e) Duration of each centration on standard square per trial.

(f) Constant error per trial.

(g) Total constant error over twelve trials.

Three standard squares were used, each square tested four times in a row. With the exception of squares instead of circles, these stimuli corresponded closely to that of Gardner's:

Stimulus A - a 10 gram neutral grey 48.5 mm. square, 5 mm. thick

Stimulus B - a 65 gram grey 48.5 mm. square, 8 mm. thick

Stimulus C - a 10 gram 50 mm. square, 5 mm. thick, covered with black velvet

Stimulus D - a light brown 48.5 mm. heavy cardboard practice square.

The subject was required to hold the standard stimuli 14 to 18 inches from his eyes with his left hand. Distance from variable stimulus screen to *S's* eyes remained constant at 16 inches. Consideration was given to *S's* preferred hand for square-size manipulation. Since the control knobs were large and simple to operate and most *Ss* were right handed, it was decided to keep all standard squares on the left. *S's* left hand was permitted to rest on the table to prevent any shifting in position of the standard square.

Standard stimuli were presented in a randomized order. Three stimuli, four trials per square constituted twelve trials. Each stimulus estimation was attempted at ascending or descending starting points. This order was fixed at ADDA. *Ss* were asked to start by making the variable square large (75 mm.) or small (20 mm.) until told to stop. Then a trial began.

The *S's* eyes were watched carefully to see which stimulus he was attending to. Eye movements were recorded. The problem of reaction

error between _S's_ eye movements and _E's_ manually operating the pen recorder was checked against a stop watch. Error range per centration measure was between 0.00 and 0.20 seconds, and again constant over all subjects. Such a minimal error was attributed to practice by _E_, and to the fact that most _Ss_ gave head movement cues before eye shifting. A 70 to 90 degree angle between standard and variable squares was pretested to ensure that _Ss_ gave ample cues before eye movement. Subjects were not allowed to see the standard square between trials.

Personality Measures

1. _Anxiety_: Taylor's (1953) Manifest Anxiety Scale was used. This scale has been used extensively and validity has been reasonably well established.

2. _Social Defensiveness_: Crowne and Marlowe (1960) have published a relatively new instrument containing 33 items designed to assess a need "to obtain approval by responding in a culturally appropriate and acceptable manner." The internal consistency coefficient is reported at .88, and test-retest reliability at .89. This test, called "Personal Reaction Inventory," correlated .35 ($p \leq .01$) with the Edwards (1957) Social Desirability Scale. Highly significant and positive correlations were also obtained when compared with the K and L scales of the MMPI. The latter scales have been interpreted as measures of defensiveness.

3. _Test of Behavioral Rigidity_ (_TBR_): A considerable variety of definitions may be found regarding behavioral rigidity (Schaie, 1960);

Graziano, 1961) referring to several "kinds" of rigidity both general and specific. The Personality-Perceptual Rigidity scale was used from the TBR. This scale attempts to sample an individual's ability in responding to unfamiliar environments and interpersonal situations. The 31 true-false items were derived from Gough's California Psychological Inventory (1957) and Lankes (1915). These items are embedded in a 75 item test. Norms are provided along a rigidity-flexibility dimension. The test is still in the experimental stage of development. Low scores indicate rigidity while high scores show flexibility.

4. Intolerance of Ambiguity: Budner (1962) has devised a 16 item Likert type scale to tap this dimension. Intolerance of ambiguity was defined as a tendency to view actual or perceived situations as sources of threat. Tolerance of ambiguity implies such situations are perceived as desirable. Ambiguous situations were defined as those which could not be structured or categorized for lack of sufficient cues. It is believed two such situations are presented to subjects in the Category Width Test and the Size Estimation Test. Thus, it was felt that intolerance of ambiguity would yield promising relationships in our test matrix.

The scale is reported to be free of acquiescence and social desirability tendencies. Concurrent validity is reported at $r = .54$.

Subjects

First year undergraduates taking an introductory educational psychology course in the Faculty of Education, University of Alberta

were used as subjects. Sixty males (mean age 24.6 years, $\sigma = 7.37$) and 82 females (mean age = 21.6 years, $\sigma = 7.28$) volunteered to participate in this study.

Method

All tests, with the exception of the Size Estimation Test, were group administered during class time at various intervals in the latter half of the academic session (two hours total per subject). All group tests were of the paper-and-pencil type.

Individual testing was required to obtain the various scanning measures on the Size Estimation Test. Subjects reported to the laboratory by appointment and received the following instructions after being seated at the apparatus:

"This test is a size estimation test. You see that I can vary the size of this square by turning these knobs [E demonstrates by making variable square larger and smaller]. You are asked to make this square [E points to variable square on screen] the same size as a standard square I am going to give you [E shows practice square]. This is just a sample square I'm giving you for practice. Hold it in your left hand like this [E demonstrates by holding practice square in left hand between thumb and second finger].

You may look back and forth as much as you like and for as long as you like. It's important that you understand this is not a speed test. This is an accuracy test. I am interested in seeing how closely you can make the variable square [E points to square on screen] the same size as

the standard square [E points to practice square in S's left hand]. Do you understand so far? [E waits for S's affirmation or answers any questions].

Now there's one more thing. I have to know when you start and when you have finished. So, to do this, I ask that you do the following. I will ask you to make it 'large' or 'small' until I tell you to stop. When you have made it the correct size, close your eyes. When I say 'Go ahead' you open your eyes and begin making this square [E points to variable square] the same size as this square [E points to practice square]. Remember, you can look back and forth, and take all the time you want. When you think you've got it, just say to me 'O.K.' and don't look back at the standard square anymore for this trial. To help you avoid looking, just turn the square down like this [E turns S's left hand down]. On the next trial after you've made it 'large' or 'small' and closed your eyes, I will say 'Go ahead' and you open your eyes, turn up the standard square and go ahead matching the squares. Each trial will be like this. O.K. so far? [E answers any questions]. At no time do I want you to pick up the standard square and place it against the screen to see how you are doing.

Finally, I'm going to be watching your eyes very closely to see which way you're looking. I'll be recording this back here. I will give you three different standard squares and we do each one four times in a row. That makes twelve trials altogether. After we're finished, I'll tell you how you made out in this test."

Results

Extensiveness of Scanning

Means and standard deviations in seconds are outlined in Table 4 for males and females. No significant sex differences between means were found, clearly showing that on the various measures of scanning derived from the simulated Size Estimation apparatus no sex differences existed in our data. Results shown in Table 5 indicate that subjects (males or females) who spent longer time intervals in judgment per trial also manifested a significantly greater number of centrations per trial, and significantly longer intervals per centration. These individuals were characterized as extensive scanners.

Intercorrelations shown for males (Table 6) yielded the following significant relationships ($p \leq .05$):

1. Males scoring high on flexibility took longer judgment times per trial. Males characterized as rigid spent less judgment time per trial.
2. High anxious males spent more time per centration.
3. There is a negative relationship for males between field-articulation and (i) total centration time spent on the standard, (ii) percentage of time spent on standard. The latter two scanning measures, however, are interdependent.

Intercorrelations for females (Table 7) at $p \leq .05$ revealed:

1. A positive relationship between (i) anxiety and judgment time per trial, (ii) anxiety and total centration time on standard.
2. High field-articulating females made significantly fewer constant errors in the estimation task.

TABLE 4

DIFFERENCES IN SECONDS BETWEEN MEANS ON SCANNING MEASURES BY SEX

Mean Scores for Scanning Measures	Mean (males)	Mean (females)	St.Dev. (males)	St.Dev. (females)	df	t*	p one-tailed test
(a) Judgment Time per Trial	15.26	15.20	9.36	8.10	140	.04	n.s.
(b) Number of Centrations on Standard	2.91	2.90	2.00	1.42	140	.05	n.s.
(c) Total Centration Time on Standard	4.06	3.98	3.12	2.61	140	.02	n.s.
(d) Percentage of Time on Standard	24.25	24.37	8.63	6.97	140	.09	n.s.
(e) Time per Centration	1.41	1.37	0.95	0.98	140	.21	n.s.
(f) Constant Error per Trial	3.16	3.08	1.97	1.80	140	.26	n.s.
(g) Total Constant Error over 12 trials	37.99	37.27	23.20	21.69	140	.19	n.s.

* t' Welch Test (Winer, 1962) where differences between variances were significant.

TABLE 5

INTERCORRELATIONS AMONG SCANNING MEASURES FOR MALES AND FEMALES*

Mean Scores for Scanning Measures	Variable	(a)	(b)	(c)	(d)	(e)	(f)	(g)
Judgment time per trial	(a)		.73	.91	.38	.52	-.02	-.00
Number of centrations on standard	(b)	.39		.68	.41	.01	-.20	-.19
Total centration time on standard	(c)	.87	.53		.67	.64	-.04	-.02
Percentage of time on standard	(d)	.22	.33	.55		.49	-.17	-.14
Time per centration	(e)	.68	-.13	.70	.38		.22	.24
Constant error per trial	(f)	-.02	.05	-.01	-.06	-.04		.99
Total constant error over 12 trials	(g)	-.04	.04	-.02	-.06	-.05	.99	

* $\underline{r} \geq .25$ ($\underline{p} \leq .05$)
$\underline{r} \geq .33$ ($\underline{p} \leq .01$) Males $\underline{N} = 60$ . . . Males above diagonal

$\underline{r} \geq .22$ ($\underline{p} \leq .05$)
$\underline{r} \geq .28$ ($\underline{p} \leq .01$) Females $\underline{N} = 82$ . . . Females below diagonal

TABLE 6

INTERCORRELATIONS BETWEEN PERSONALITY, FIELD-ARTICULATION, AND SCANNING MEASURES FOR MALES*

Scanning Measures / Personality and Field-Articulation Measures	Rigidity-Flexibility	Anxiety	Social Defensiveness	Intolerance of Ambiguity	Field-Articulation
(a) Judgment time per trial	.25	.10	.14	.19	-.19
(b) Number of centrations on standard	.17	.08	.23	.19	-.19
(c) Total centration time on standard	.21	.16	.12	.15	-.27
(d) Percentage of time on standard	.07	.23	.03	.17	-.26
(e) Time per centration	.05	.28	.01	.24	-.16
(f) Constant error per trial	.02	-.01	-.01	.16	-.19
(g) Total constant error over 12 trials	.03	-.04	.02	-.06	-.18

* $r \geq .25$ ($p \leq .05$)
$r \geq .33$ ($p \leq .01$)

TABLE 7

INTERCORRELATIONS BETWEEN PERSONALITY, FIELD-ARTICULATION, AND SCANNING MEASURES FOR FEMALES*

Scanning Measures \ Personality and Field-Articulation Measures	Rigidity-Flexibility	Anxiety	Social Defensiveness	Intolerance of Ambiguity	Field-Articulation
(a) Judgment time per trial	.06	.22	-.05	.03	.17
(b) Number of centrations on standard	.02	.18	-.02	-.03	.14
(c) Total centration time on standard	.09	.22	-.06	.03	.12
(d) Percentage of time on standard	-.10	.18	-.19	-.01	.01
(e) Time per centration	.05	.15	-.08	.04	.05
(f) Constant error per trial	-.11	.09	-.18	.13	-.24
(g) Total constant error over 12 trials	-.10	.08	-.20	.13	-.25

* $r \geqq .22$ ($p \leqq .05$)
$r \geqq .28$ ($p \leqq .01$)

Examination of high-low dichotomized intra-sex differences between means (Tables 8 and 9) pointed out wide variation. High anxious males devoted a greater percentage of time (in seconds) on the standard (scanning measure d) than low anxious males. High social defensive males centrated significantly more often than low defensive males. Finally, significant differences were also found for dichotomized groups of males on intolerance of ambiguity and two interdependent scanning measures, (d) percentage of time on standard and (e) time spent per centration. Males intolerant of ambiguity spent greater time on both these scanning measures.

In the female sample, high-low dichotomized samples reacted significantly only on anxiety (Table 9). High anxious females showed significantly greater means than low anxious females on scanning measures:

(a) judgment time per trial ($\underline{p} \leq .01$)

(b) number of centrations on standard ($\underline{p} \leq .007$)

(c) total time spent on centrations ($\underline{p} \leq .01$).

High anxious females also made significantly greater total constant errors than did low anxious females. Thus, it becomes apparent that both males and females identified as extensive scanners were reacting, for different reasons, to the size estimation task with a disposition to reduce uncertainty, and to make very sure of their decisions before commitment to a response.

Zero-order correlations between personality measures and scanning measures were outlined for all groups bearing significant results

TABLE 8

SIGNIFICANT INTRA-SEX DIFFERENCES BETWEEN MEANS AMONG MALE SUBGROUPS ON MEASURES OF SCANNING IN SECONDS

Subgroup	Mean High Subgroup	N	Mean Low Subgroup	N	St.Deviation High Subgroup	St.Deviation Low Subgroup	df	t*	p one-tailed test
Anxiety Subgroup on Scanning Measure (d)	26.57	27	22.75	29	6.75	9.75	48.0	1.72	.04
Social Defensiveness Subgroup on Scanning Measure (b)	3.45	28	2.51	28	2.46	1.39	42.68	1.75	.04
Intolerance of Ambiguity Subgroup on: (d)	26.22	29	21.47	28	7.87	8.83	55	2.11	.02
(e)	1.59		1.18		1.10	0.70	47.65	1.68	.05

* t' Welch Test (Winer, 1962) where significant differences in variances were found.

TABLE 9

SIGNIFICANT INTRA-SEX DIFFERENCES BETWEEN MEANS AMONG FEMALE SUBGROUPS ON MEASURES OF SCANNING IN SECONDS

Subgroup	Mean High Subgroup	N	Mean Low Subgroup	N	St.Deviation High Subgroup	St.Deviation Low Subgroup	df	t*	p (one-tailed test)
Anxiety Subgroups on Scanning Measures:									
(a)	17.11	39	13.17	39	8.77	6.80	71.53	2.21	.01
(b)	3.33		2.55		1.66	1.03	63.48	2.47	.01
(c)	4.66		3.35		2.66	2.43	76	2.25	.01
(g)	40.47		32.24		24.03	15.89	65.89	1.78	.04

* t' Welch Test (Winer, 1962) where significant differences in variances were found.

(Tables 10 and 11). For males, the majority of evidence again supported the uncertainty reduction hypothesis. Rigidity-flexibility did not. Subjects scoring as rigid spent less time on the various scanning measures, regardless of classification on anxiety, social defensiveness, and intolerance of ambiguity. Results for the female sample were more conflicting. Females intolerant of ambiguity made greater errors in judgment on the scanning apparatus. Relationships between rigidity-flexibility and scanning measures were also contrary to expectations.

Since some of our scanning measures were redundant, the following were selected as indicators of extensiveness of scanning:

(a) mean judgment time per trial

(b) mean number of centrations on standard per trial

(c) mean time per centration per trial

Regression models were tested to determine the extent of variance contribution of given personality measures to the variance found in the above scanning measures. Results of these analyses were reported in Appendix A (Tables 1a to 6a). From these tables, Figures 1 to 8 were plotted showing the significant relationships between the selected scanning measures and given personality measures. Most figures support the hypothesis of uncertainty reduction. For males, anxiety contributed the least amount of variance over and above the remaining predictors. Rigidity-flexibility related to the scanning measures opposite to that expected. Individuals scoring as rigid spent less time making decisions on the simulated size estimation task.

Models tested for interaction effects between scanning and

TABLE 10

CORRELATIONS BETWEEN PERSONALITY AND SCANNING MEASURES FOR DICHOTOMIZED MALE GROUPS

Group	N	Variables	r*
High Anxious	27	Social Defensiveness and Scanning Measure (b)	.42
Low Anxious	29	Intolerance of Ambiguity and Scanning Measure (a)	.39
High Social Defensiveness	28	Rigidity-Flexibility and Scanning Measure (a)	.40
		Intolerance of Ambiguity and Scanning Measure (a)	.37
		Intolerance of Ambiguity and Scanning Measure (c)	.38
Low Social Defensiveness	28	Rigidity-Flexibility and Total Constant Error	.40
High Intolerance of Ambiguity	29	Social Defensiveness and Scanning Measure (a)	.48
		Social Defensiveness and Scanning Measure (b)	.37
		Social Defensiveness and Scanning Measure (c)	.51
Low Intolerance of Ambiguity	28	Rigidity-Flexibility and Scanning Measure (a)	.51
		Rigidity-Flexibility and Scanning Measure (c)	.47
		Rigidity-Flexibility and Scanning Measure (e)	.51
		Social Defensiveness and Scanning Measure (e)	-.39

* $p \leq .05$

TABLE 11

CORRELATIONS BETWEEN PERSONALITY AND SCANNING MEASURES FOR DICHOTOMIZED FEMALE GROUPS

Group	N	Variables	r*
Low Anxious	39	Intolerance of Ambiguity and Mean Constant Error/Trial	.38
		Intolerance of Ambiguity and Total Constant Error/12 Trials	.38
High Social Defensiveness	36	Rigidity-Flexibility and Scanning Measure (e)	.36
Low Social Defensiveness	41	Social Defensiveness and Scanning Measure (e)	-.42
		Social Defensiveness and Mean Constant Error/Trial	-.42
High Intolerance of Ambiguity	33	Rigidity-Flexibility and Scanning Measure (e)	.39
		Intolerance of Ambiguity and Mean Constant Error/Trial	.39
		Intolerance of Ambiguity and Total Constant Error/12 Trials	.42
Low Intolerance of Ambiguity	46	Anxiety and Scanning Measure (c)	.32

* $p \leq .05$

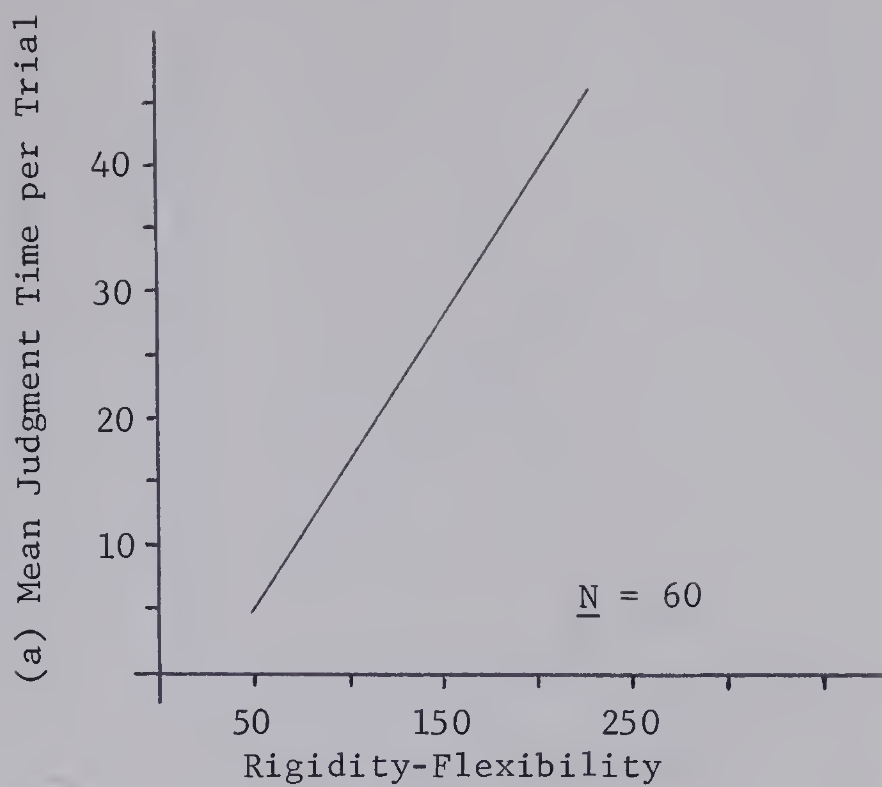

Figure 1. Relationship between rigidity-flexibility and scanning measure (a) for males, keeping anxiety, social defensiveness, and intolerance of ambiguity constant at their respective means.

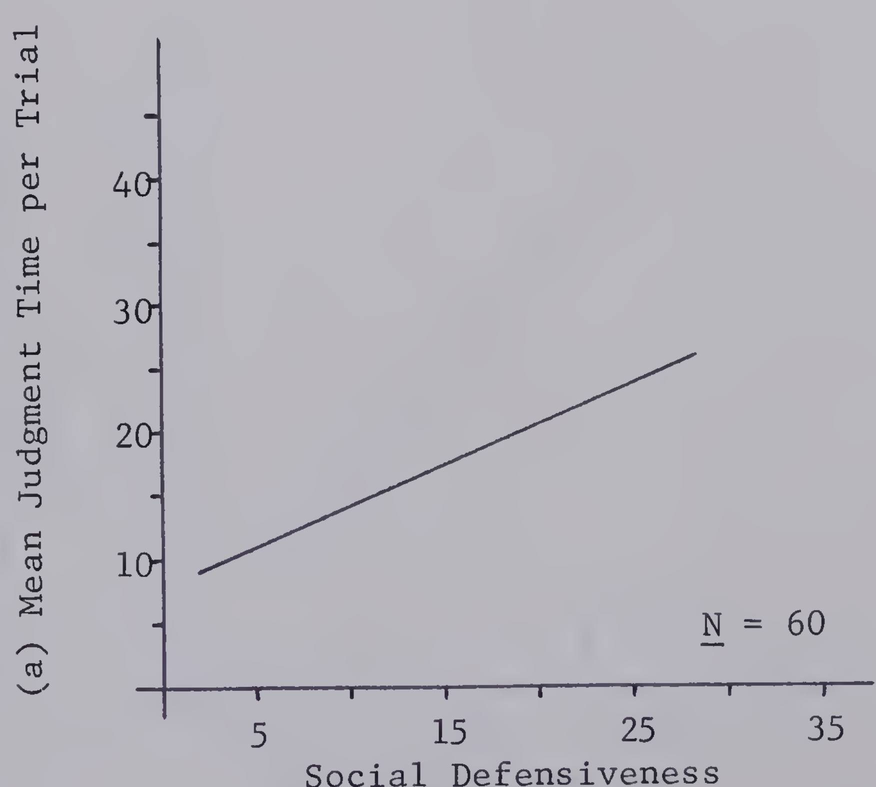

Figure 2. Relationship between social defensiveness and scanning measure (a) for males, keeping rigidity-flexibility, anxiety, and intolerance of ambiguity constant at their respective means.

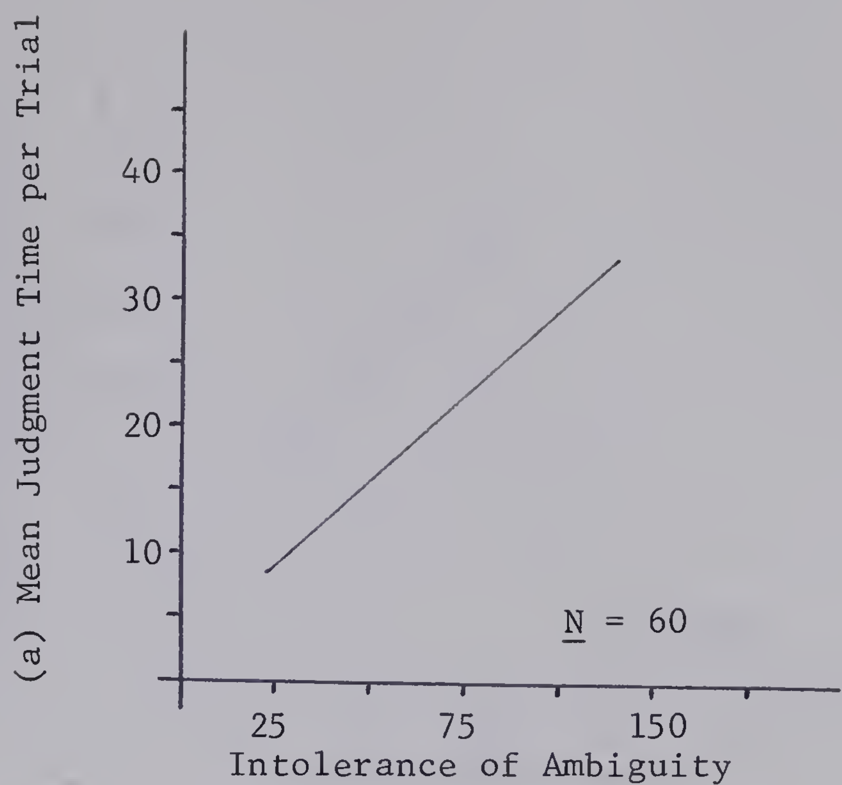

Figure 3. Relationship between intolerance of ambiguity and scanning measure (a) for males, keeping rigidity-flexibility, anxiety, and social defensiveness constant at their respective means.

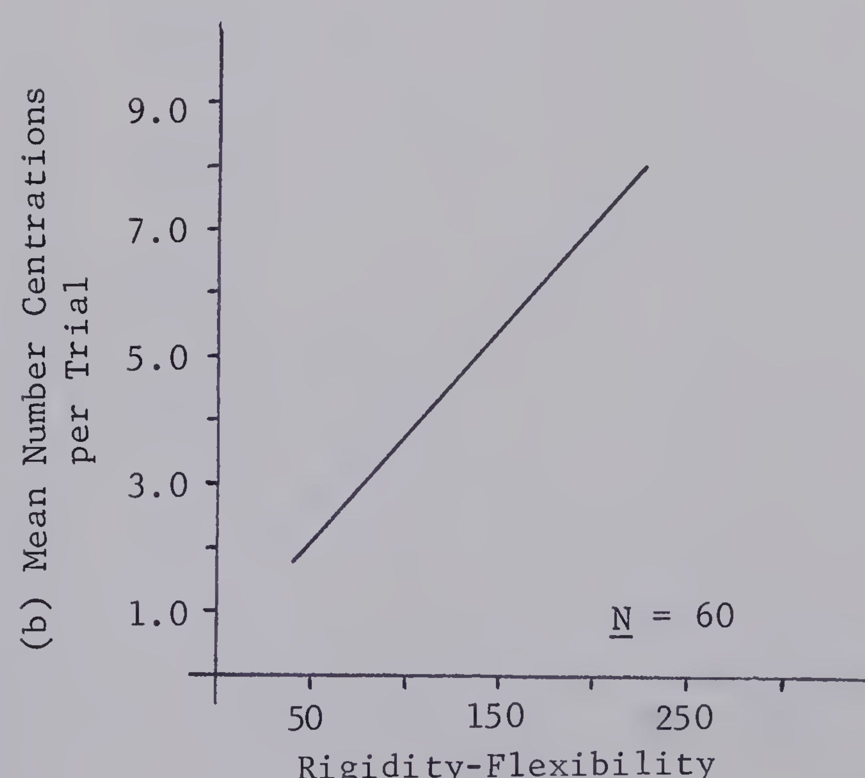

Figure 4. Relationship between rigidity-flexibility and scanning measure (b) for males, keeping anxiety, social defensiveness, and intolerance of ambiguity constant at their respective means.

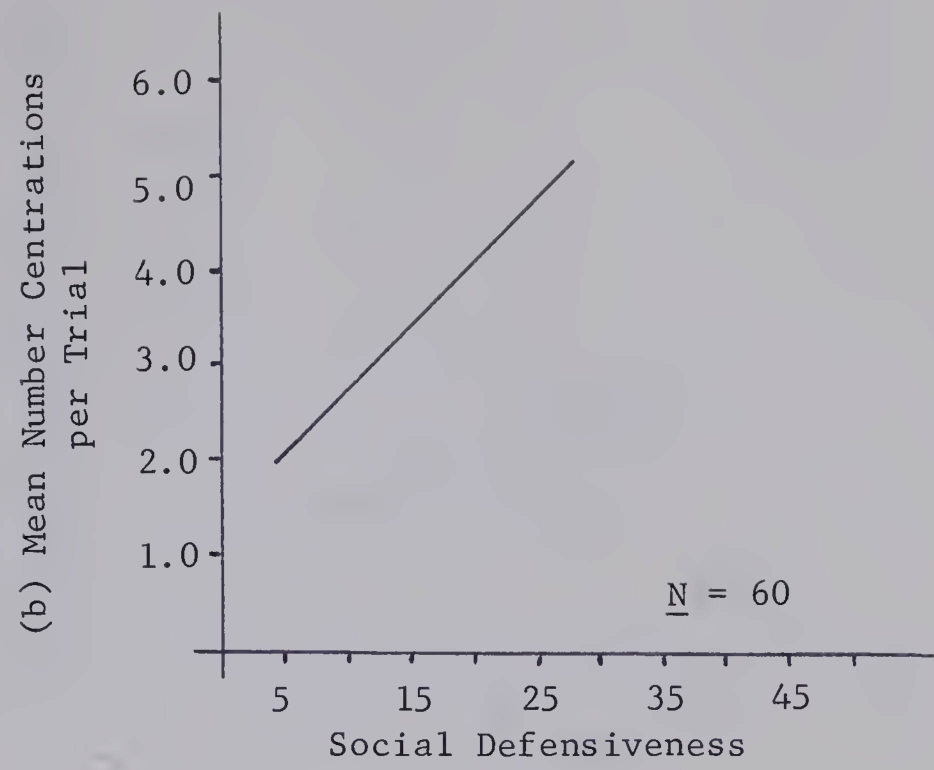

Figure 5. Relationship between social defensiveness and scanning measure (b) for males, keeping rigidity-flexibility, anxiety, and intolerance of ambiguity constant at their respective means.

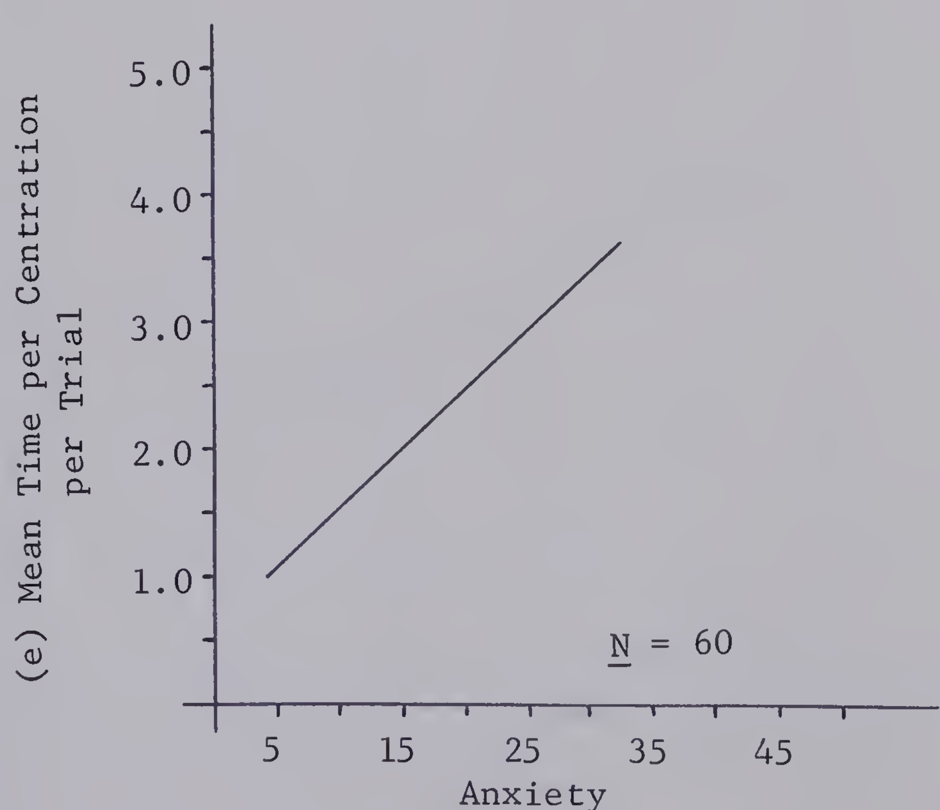

Figure 6. Relationship between anxiety and scanning measure (e) for males, keeping rigidity-flexibility, social defensiveness, and intolerance of ambiguity constant at their respective means.

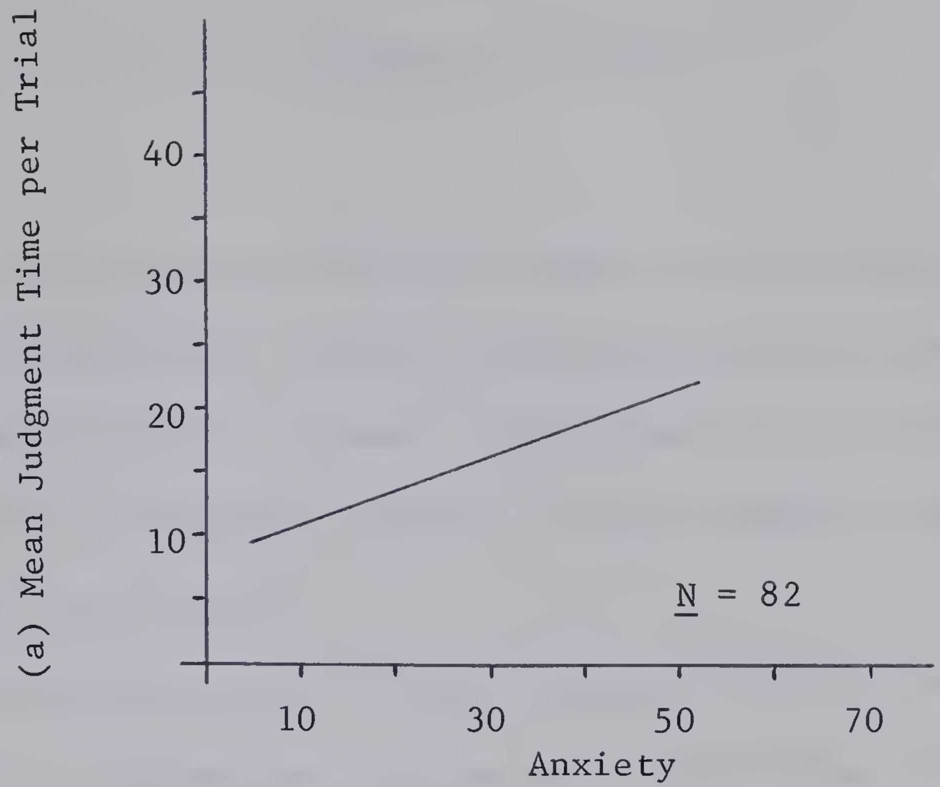

Figure 7. Relationship between anxiety and scanning measure (a) for females, keeping rigidity-flexibility, social defensiveness, and intolerance of ambiguity constant at their respective means.

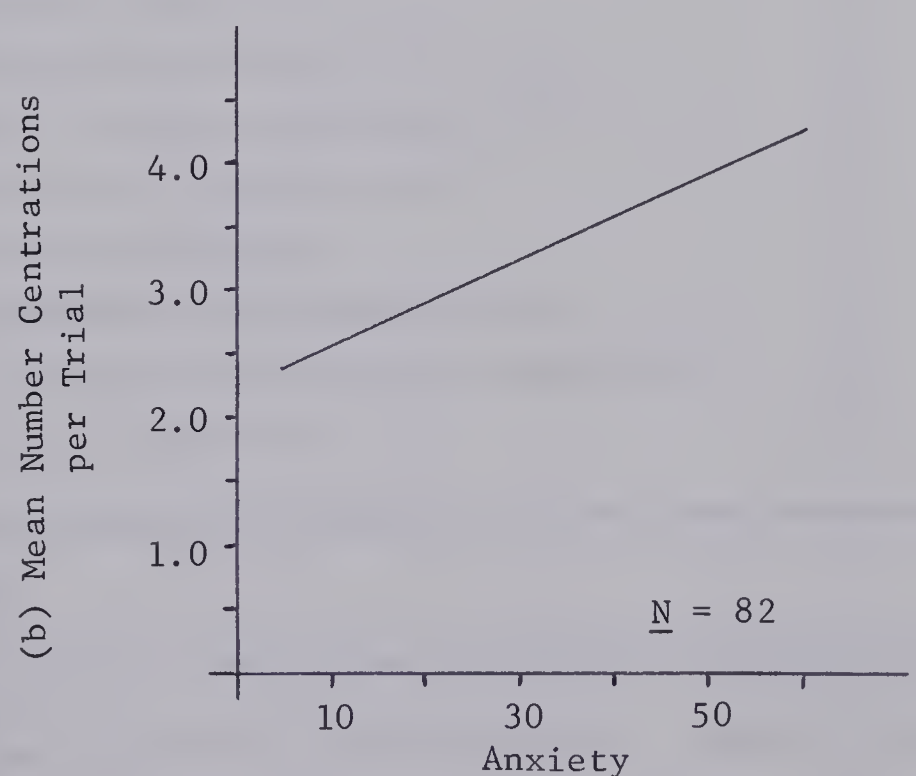

Figure 8. Relationship between anxiety and scanning measure (b) for females, keeping rigidity-flexibility, social defensiveness, and intolerance of ambiguity constant at their respective means.

personality measures yielded no significant results.

Category Width

Several significant sex differences between means were found (Table 12) for category width, rigidity-flexibility, anxiety, and social defensiveness. Males scored as broader categorizers and more flexible than females. However, males were shown to be less anxious and less socially defensive than females.

Intercorrelations between criterion and predictors by sex are reported in Table 13. Zero-order correlations revealed the following significant relationships as extracted below in chart form:

Variables	Sex	Correlation *
Social Defensiveness and Rigidity-Flexibility	M	-.29
Rigidity-Flexibility and Scanning Measure (a)	M	.25
Anxiety and Scanning Measure (e)	M	.28
Field-Articulation and Scanning Measure (c)	M	-.27
Field-Articulation and Scanning Measure (d)	M	-.26
Social Defensiveness and Category Width	F	-.22
Social Defensiveness and Anxiety	F	-.27
Intolerance of Ambiguity and Category Width	F	-.25
Intolerance of Ambiguity and Rigidity-Flexibility	F	-.35
Anxiety and Scanning Measure (a)	F	.22

* $p \leq .05$

Regression models were tested to determine which predictors contributed to the variance of category width. Separate sets of models were tested for males and females. None of the models yielded

TABLE 12

SIGNIFICANT SEX DIFFERENCES BETWEEN MEANS ON CRITERION AND PREDICTOR VARIABLES

Variable	Mean (males)*	Mean (females)*	St.Dev. (males)	St.Dev. (females)	df	t	p (one-tailed test)
Category Width	74.18	59.16	15.28	14.82	140	5.85	.0001
Rigidity-Flexibility	101.17	96.89	14.56	14.46	140	1.72	.04
Anxiety	14.42	20.00	6.60	7.28	140	4.66	.0001
Social Defensiveness	14.07	15.84	5.68	5.13	140	1.93	.03

* Males N = 60

Females N = 82

TABLE 13

INTERCORRELATIONS AMONG VARIABLES FOR MALES AND FEMALES*

Variables	No.	1.	2.	3.	4.	5.	6.	7.	8.
Category Width	1.		.21	-.20	-.10	-.08	.08	.13	.02
Rigidity-Flexibility	2.	.19		-.04	-.29	-.16	-.11	.25	.17
Anxiety	3.	.07	-.11		-.13	.23	.01	.10	.08
Social Defensiveness	4.	-.22	-.19	-.27		-.07	.06	.14	.23
Intolerance of Ambiguity	5.	-.25	-.35	.21	.09		-.12	.19	.15
Field-Articulation	6.	.18	.10	.01	.07	-.11		-.19	-.19
Extensiveness of Scanning (a)	7.	.16	.06	.22	-.05	.03	.17		.73
(b)	8.	.13	.02	.18	-.02	-.03	.14	.39	
(c)	9.	.22	.09	.22	-.06	.03	.12	.87	.53
(d)	10.	.21	-.10	.18	-.12	-.01	.01	.22	.33
(e)	11.	.16	.05	.15	-.08	.04	.05	.68	-.13
Constant Errors per Trial (f)	12.	-.12	-.11	.09	-.18	.13	-.24	-.02	.05
Total Constant Errors over 12 Trials (g)	13.	-.13	-.10	.08	-.20	.13	-.25	-.04	.04
Age (in years)	14.	-.02	-.08	-.13	.06	.07	-.15	-.07	-.01

CONTINUED

TABLE 13 (CONTINUED)

Variables	No.	9.	10.	11.	12.	13.	14.
Category Width	1.	.03	-.11	.01	-.07	-.07	.22
Rigidity-Flexibility	2.	.21	.07	.05	.02	.03	-.01
Anxiety	3.	.16	.23	.28	-.01	-.04	.19
Social Defensiveness	4.	.12	.03	.01	-.01	.02	-.19
Intolerance of Ambiguity	5.	.17	.24	.16	-.06	-.04	.22
Field-Articulation	6.	-.27	-.26	-.16	-.19	-.18	.15
Extensiveness of Scanning (a)	7.	.91	.38	.52	-.02	-.00	.26
(b)	8.	.68	.41	.01	-.20	-.19	-.25
(c)	9.		.67	.64	-.04	-.02	-.24
(d)	10.	.55		.49	-.17	-.14	-.14
(e)	11.	.70	.38		.22	.24	-.07
Constant Errors per Trial (f)	12.	-.01	-.06	-.04		.99	.00
Total Constant Errors over 12 Trials (g)	13.	-.02	-.06	-.05	.99		-.01
Age (in years)	14.	-.06	.01	-.00	.08	.09	

* $r \geq .25$ ($p \leq .05$) Males N = 60, Intercorrelations above diagonal.
$r \geq .33$ ($p \leq .01$)
$r \geq .22$ ($p \leq .05$) Females N = 82, Intercorrelations below diagonal.
$r \geq .28$ ($p \leq .01$)

significant results (Appendix A, Tables 7a and 8a). Tests for interaction effects by sex also proved insignificant (Appendix A, Table 9a).

The data were subsequently reclassified into a high-low dichotomy by personality measure and by sex. The same sets of regression models were tested on these new samples. The volume of regression analyses precluded the reporting of all tests for significance. Only those results $\underline{p} \leq .10$ were outlined in Table 14. The relationships have been drawn in Figures 9 to 16, in each case showing category width decreasing as personality scores assume high values. The one exception was the relationship between category width and rigidity-flexibility. Individuals characterized as rigid scored as narrow categorizers, while flexible subjects increased in breadth of categorization. A significant positive relationship was found between field-articulation and category width for low anxious females.

Conversely, subjects shown to be free of anxiety, rigidity, social defensiveness, and tolerant of ambiguity preferred broad categorization.

Anxiety was the most significant predictor, accounting for the greatest amount of variance over and above that contributed by the remaining personality predictors.

Extensiveness of Scanning and Category Width

Intercorrelations between all scanning measures and category width for males and females were previously reported in Table 13. None of these was significant.

TABLE 14

TESTING FOR SIGNIFICANCE OF PERSONALITY PREDICTORS TO CATEGORY WIDTH AMONG HIGH-LOW DICHOTOMIZED SUBGROUPS OF MALES AND FEMALES*

Subgroup by Sex	N	Predictor to Criterion	RSQ_1 Full Model	RSQ_2 Restr. Model	df	F	p	Percentage Contribution of Predictor to Criterion
High-Anxious Males	27	Rigidity-Flexibility	.27	.12	1/21	4.06	.06	14.20%
Low-Anxious Males	29	Anxiety	.38	.04	1/23	12.54	.002	34.00%
Low-Anxious Females	39	Intolerance of Ambiguity	.21	.14	1/33	3.11	.09	7.40%
Low-Anxious Females	39	Field-Articulation	.21	.11	1/33	4.26	.05	10.13%
High-Defensive Males	28	Anxiety	.31	.21	1/22	3.32	.08	10.38%
High-Defensive Females	36	Rigidity-Flexibility	.19	.09	1/30	3.52	.07	9.55%
Low-Defensive Females	41	Intolerance of Ambiguity	.13	.02	1/35	4.26	.05	10.59%
High Intolerance of Ambiguity Females	33	Intolerance of Ambiguity	.19	.07	1/27	3.86	.06	11.60%

* Results reported only where $p \leq .10$.

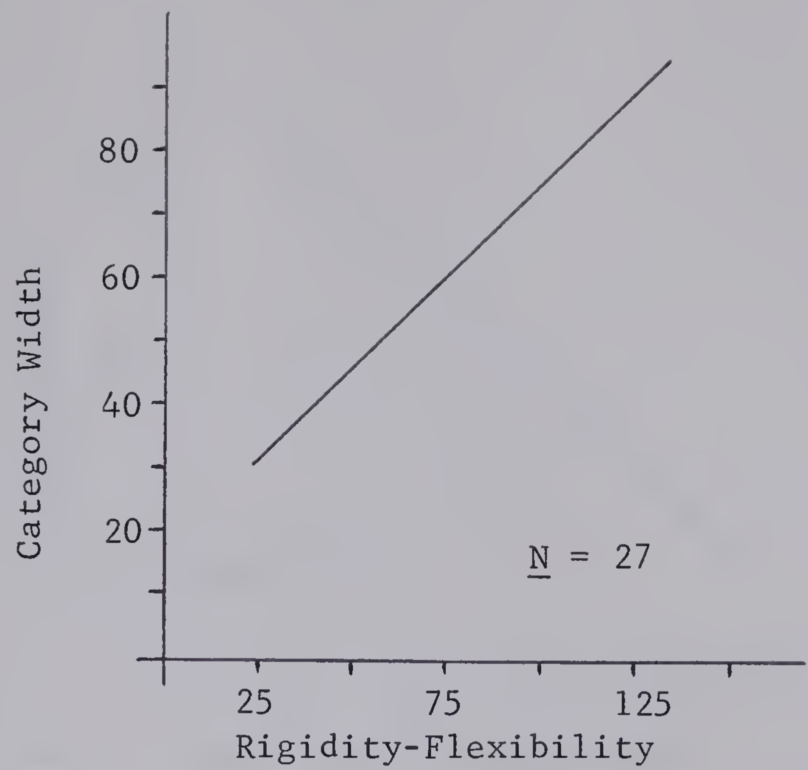

Figure 9. Relationship between rigidity-flexibility and category width for high anxious males, keeping social defensiveness, intolerance of ambiguity, and field-articulation constant at their respective means.

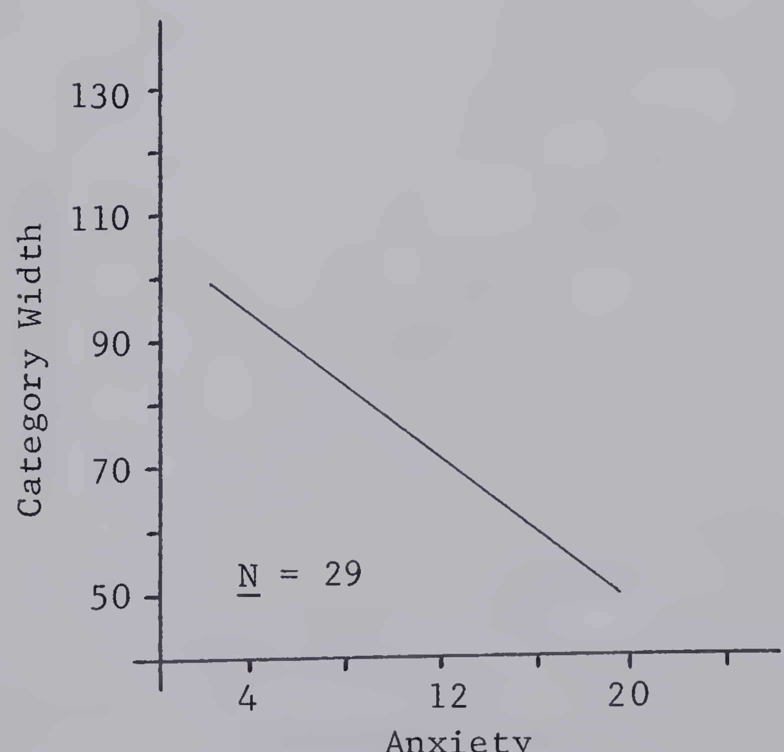

Figure 10. Relationship between anxiety and category width for low anxious males, keeping rigidity-flexibility, social defensiveness, intolerance of ambiguity, and field-articulation constant at their respective means.

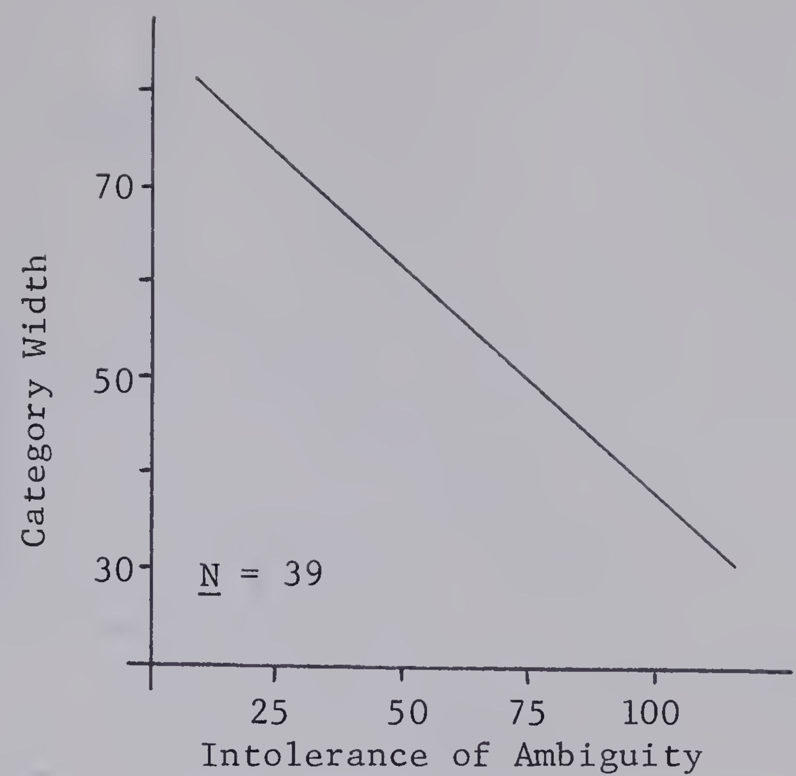

Figure 11. Relationship between intolerance of ambiguity and category width for low anxious females, keeping rigidity-flexibility, social defensiveness, anxiety, and field-articulation constant at their respective means.

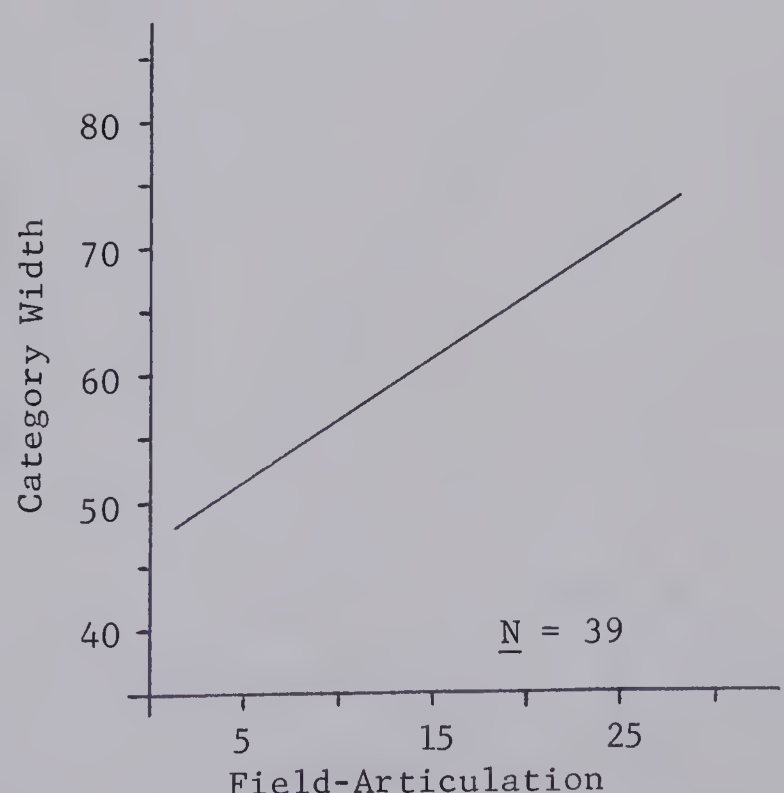

Figure 12. Relationship between field-articulation and category width for low anxious females, keeping rigidity-flexibility, anxiety, social defensiveness, and intolerance of ambiguity constant at their respective means.

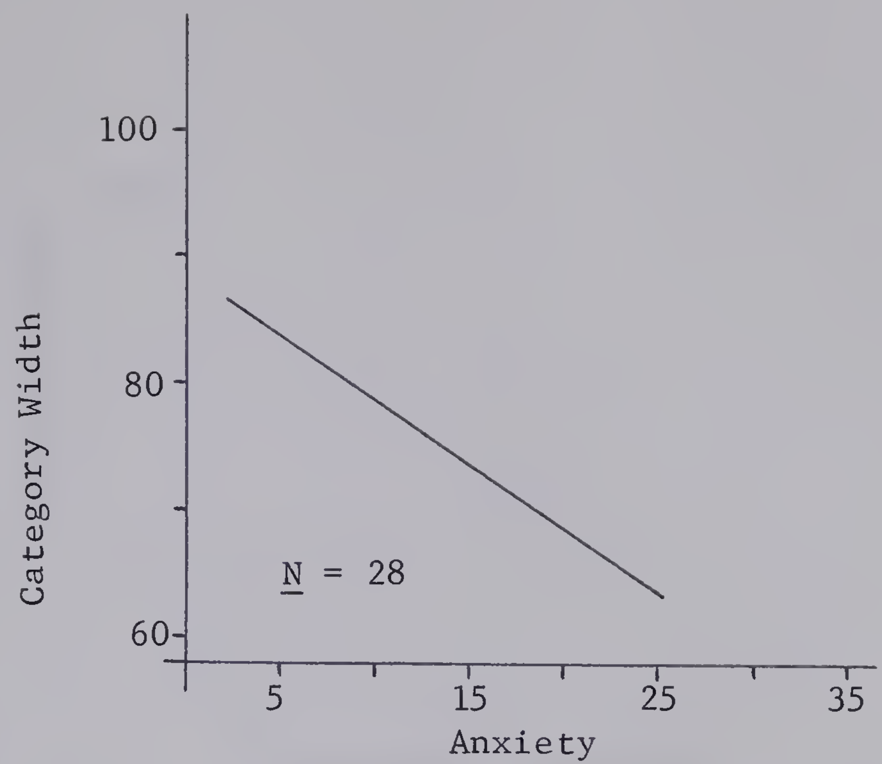

Figure 13. Relationship between anxiety and category width for high social defensive males, keeping rigidity-flexibility, intolerance of ambiguity, and field-articulation constant at their respective means.

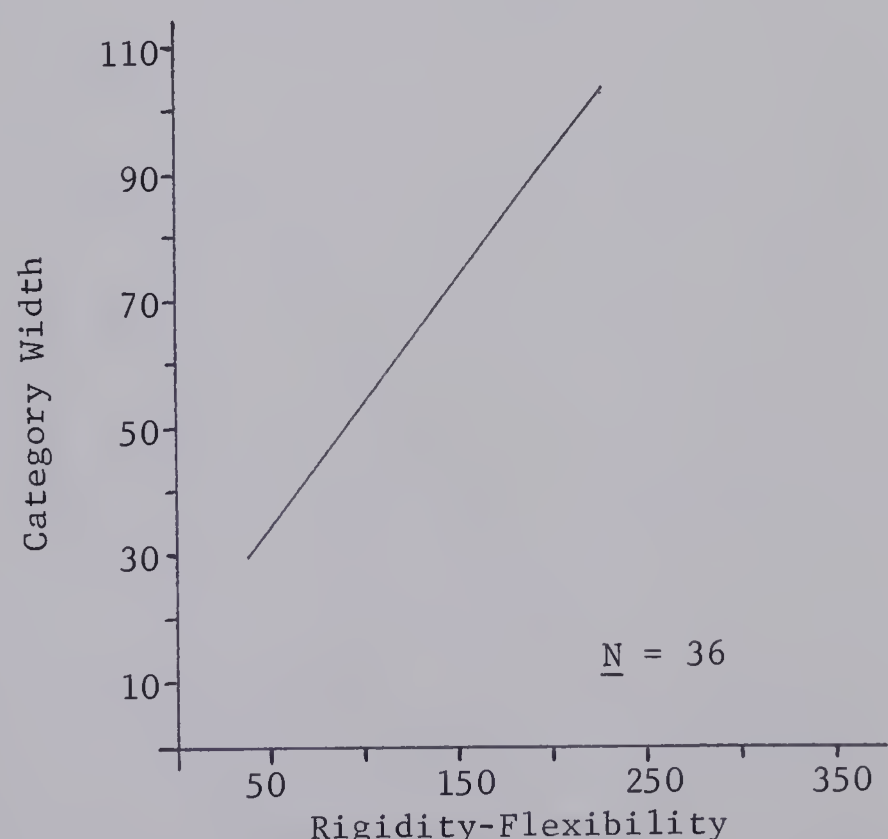

Figure 14. Relationship between rigidity-flexibility and category width for high defensive females, keeping anxiety, intolerance of ambiguity, and field-articulation constant at their respective means.

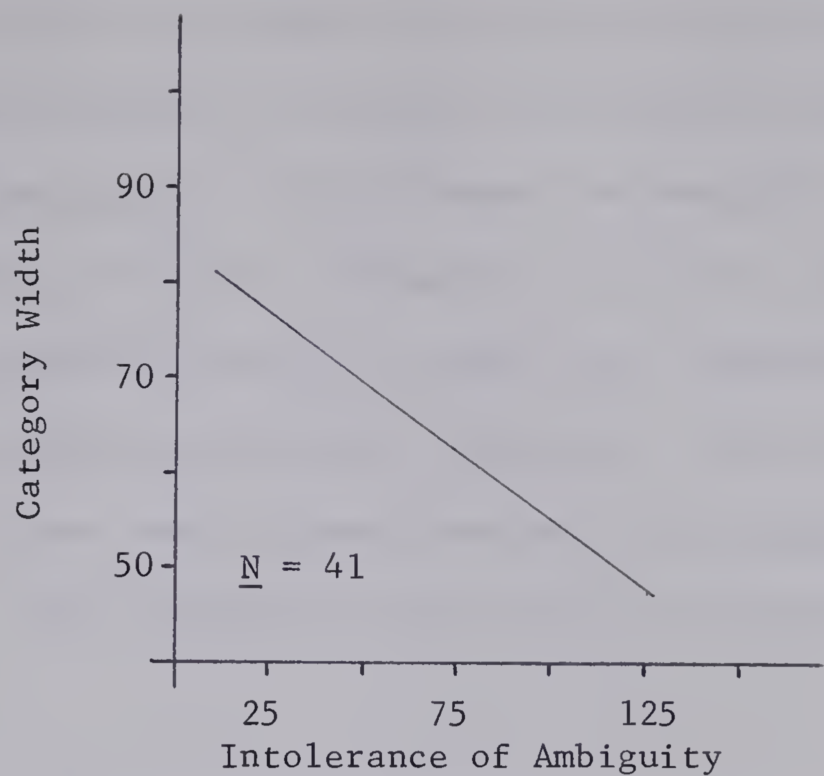

Figure 15. Relationship between intolerance of ambiguity and category width for low defensive females, keeping rigidity-flexibility, anxiety, and field-articulation constant at their respective means.

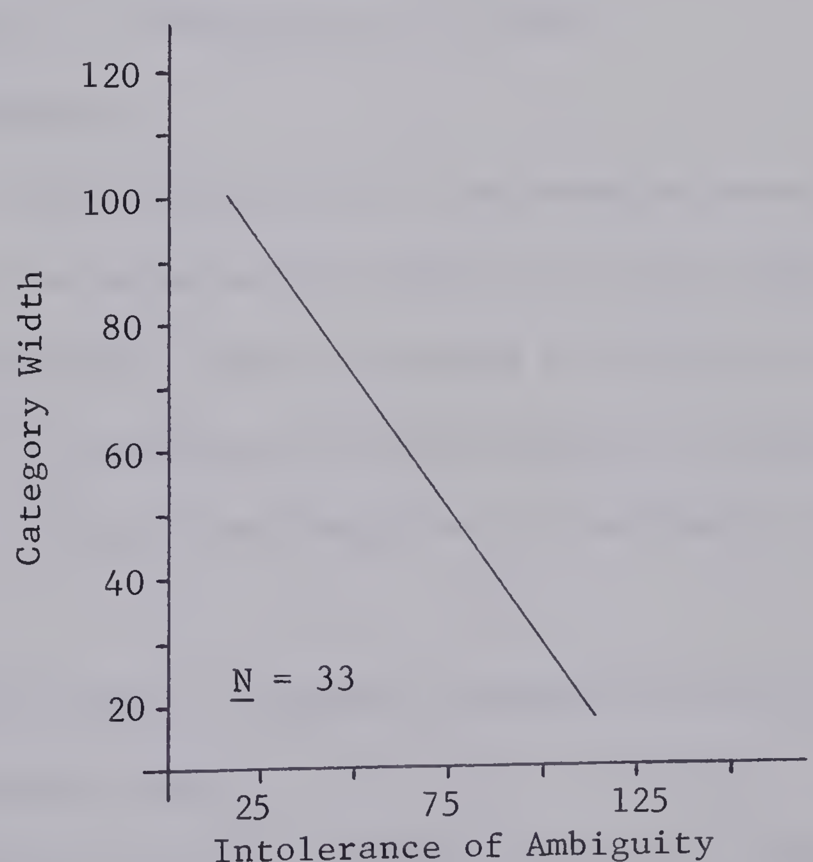

Figure 16. Relationship between intolerance of ambiguity and category width for high intolerance of ambiguity females, keeping rigidity-flexibility, social defensiveness, anxiety, and field-articulation constant at their respective means.

Regression models were tested using all scanning measures as predictors and category width as criterion, for subjects dichotomized on anxiety, social defensiveness, and intolerance of ambiguity. These were reported in Appendix A, Table 10a. Figures 17 to 22 have been plotted highlighting the significant results of Table 10a. The majority of these support the uncertainty reduction hypothesis. The two exceptions (Figures 17 and 21) show mean judgment time per trial <u>positively</u> related to category width. This association was contrary to expectations.

<u>Summary of Results</u>

Considerable evidence has been offered to support the argument that certain individuals react to the Size Estimation Test (extensiveness of scanning) and the Category Width Test as an ambiguous situation offering minimal cues, and thereby invoking risky and uncertain decision making. This evidence is summarized as follows:

<u>Extensiveness of Scanning</u>

1. No differences between means on all the scanning measures were found, comparing the total male sample against the total female sample.
2. Subjects who spent more time in judgment per trial, also revealed a greater number of centrations on the standard, and spent more time per centration. These individuals were classified as extensive scanners.
3. High anxious males spent a greater percentage of time on the standard than did low anxious males.
4. High social defensive males preferred to take more centrations on the standard than did low social defensive males.

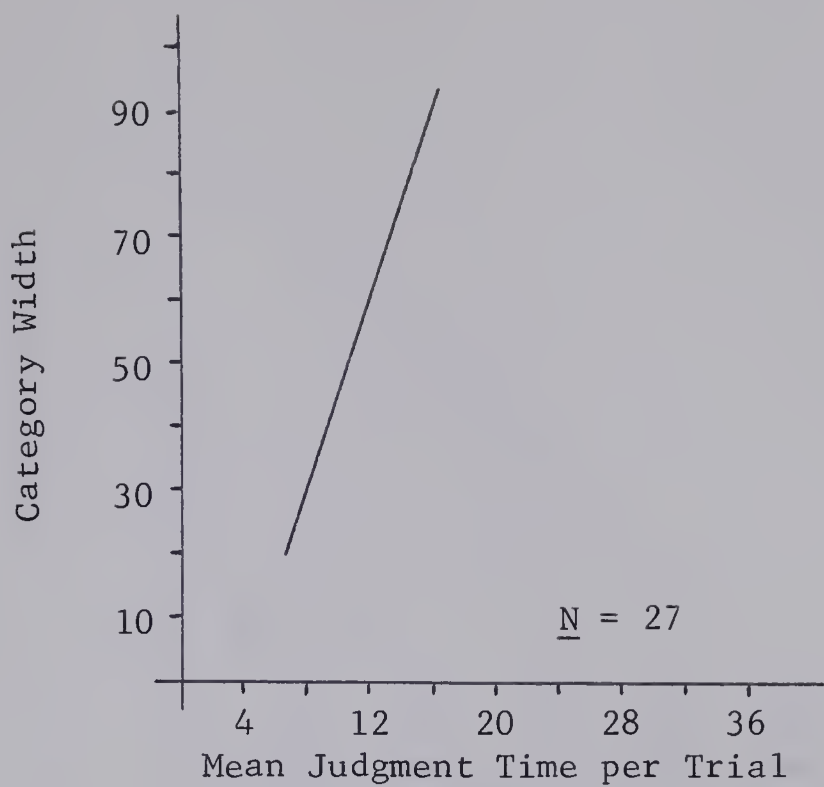

Figure 17. Relationship between mean judgment time per trial and category width for high anxious males, keeping rigidity-flexibility, social defensiveness, and intolerance of ambiguity constant at their respective means.

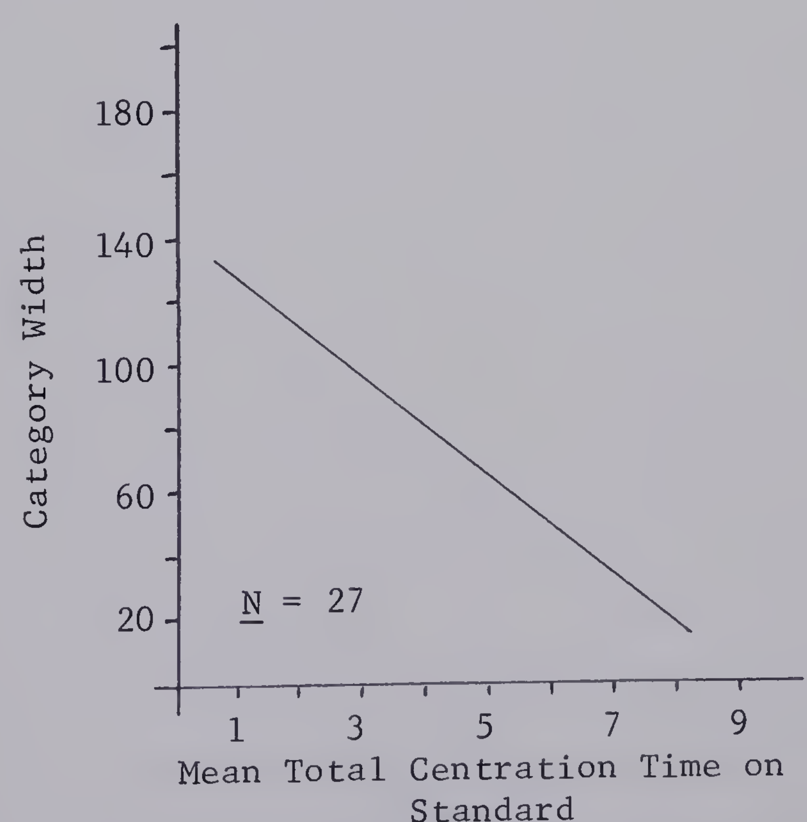

Figure 18. Relationship between mean total centration time on standard and category width for high anxious males, keeping remainder of personality variables constant at their respective means.

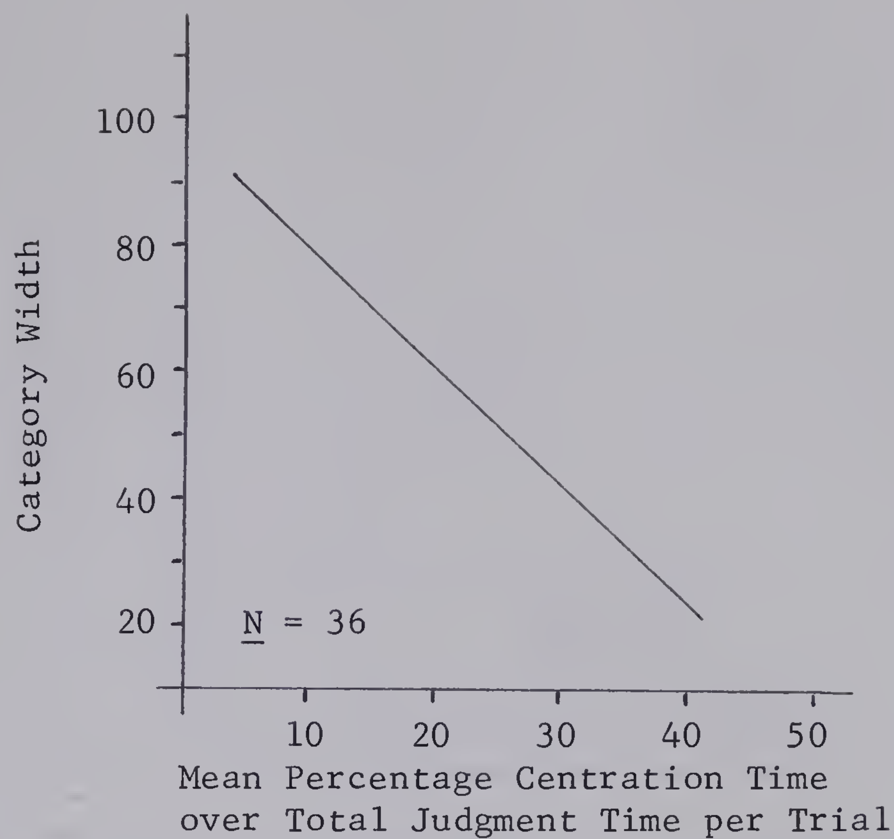

Figure 19. Relationship between mean percentage centration time over total judgment time per trial and category width for high social defensive females, keeping remainder of personality variables constant at their respective means.

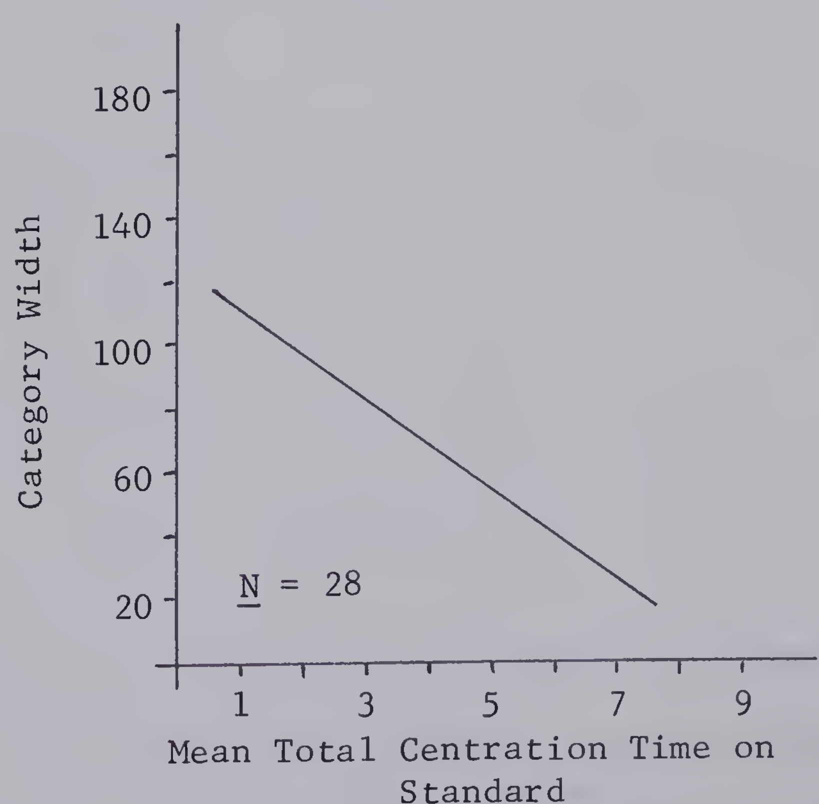

Figure 20. Relationship between mean total centration time on standard and category width for low social defensive males, keeping remainder of personality variables constant at their respective means.

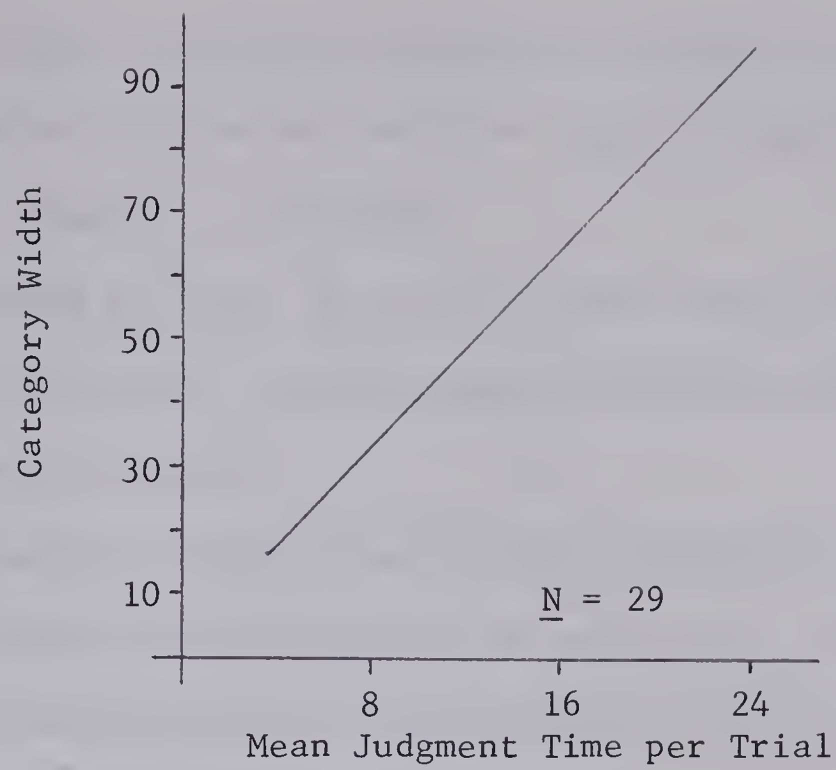

Figure 21. Relationship between mean judgment time per trial and category width for high intolerance of ambiguity males, keeping remainder of personality variables constant at their respective means.

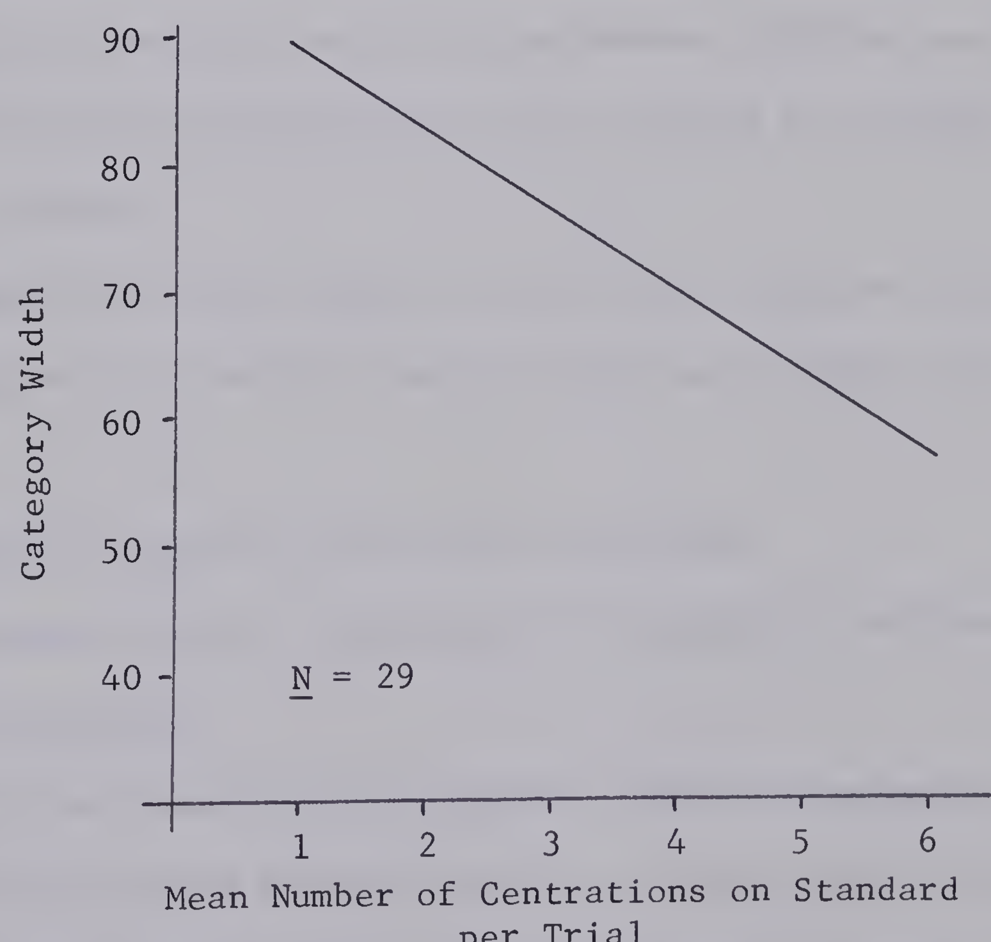

Figure 22. Relationship between mean number of centrations on standard per trial and category width for high intolerance of ambiguity males, keeping remainder of personality variables constant at their respective means.

5. Males showing a high intolerance of ambiguity spent a greater percentage of time on the standard and took longer centrations than did males more tolerant of ambiguity.
6. Males characterized as rigid, as a whole spent less time in making their judgments per trial, and made fewer centrations than did males classified as flexible.
7. High anxious females (i) took greater time in making an estimation per trial, (ii) took a greater number of centrations, (iii) spent a greater total centration time on the standard, and (iv) made greater constant errors than did low anxious females.
8. Personality measures other than anxiety were also related to scanning measures for females. These relationships were, however, contingent upon given combinations of personality measures. Nevertheless, a conclusion can be drawn that social defensiveness, intolerance of ambiguity, and rigidity-flexibility are all related to scanning measures. For example:
   - (i) High defensive, rigid females spent little time per centration. High defensive, flexible females preferred to take long centrations.
   - (ii) Low defensive females took long centrations.
   - (iii) Rigid females, high on intolerance of ambiguity preferred short centrations.
9. The conclusion from the preceding summation leads one to believe that different intervening motivational dispositions lead to similar results among rigid, high defensive, and intolerance of ambiguity

females. Flexible, low defensive females devote more deliberation time per centration. The interpretation is not entirely clear on this point.

Field-Articulation

1. High field-articulating males spent less total centration time on the standard.
2. High field-articulating females made fewer constant errors in the size estimation task.

Category Width

1. Males scored as broader categorizers than females. This finding has been reported in the literature.
2. The female sample as a whole showed category width negatively related to intolerance of ambiguity. Regression analysis revealed intolerance of ambiguity to be a near significant predictor ($p \leq .08$). Nevertheless, the negative relationship was upheld.
3. For the male sample, none of the given personality predictors accounted for much of the variance in category width.
4. While males and females as samples demonstrated few significant relationships between personality predictors and category width, high-low dichotomized subgroups of samples revealed several relationships. In each case, one predictor was sequentially dropped from the full regression model to test for differences in variances accounted for.
5. Thus, high anxious, rigid males were shown to be narrow categorizers. High anxious, flexible males scored as broad categorizers.

6. Males within the low anxious classification revealed a negative relation between anxiety and category width.
7. High social defensive males reduced category breadth with increasing anxiety.
8. Low anxious females reduced category breadth with increasing intolerance of ambiguity.
9. Low anxious females characterized as high field-articulators scored as broad categorizers.
10. High defensive, rigid females scored as narrow categorizers while high defensive, flexible females scored as broad categorizers.
11. Low defensive females reduced category breadth with increasing intolerance of ambiguity.

<u>Scanning Measures and Category Width</u>

1. In the male sample, high anxious subjects who spent greater centration time on standard were also narrow categorizers. A similar relationship was shown for low social defensive males.
2. Males classified under high intolerance of ambiguity showed a negative relation between category width and mean number of centrations on standard.
3. Results opposite to those expected were revealed for (i) the relation between category width and mean judgment time per trial for high anxious males; (ii) the relation between category width and mean judgment time per trial for males intolerant of ambiguity. These do not support the uncertainty reduction hypothesis.
4. In the female sample, high social defensive subjects who spent a

greater percentage centration time over total judgment time were also narrow categorizers.

Discussion

Others working in the area of cognitive styles have suggested that measures of category breadth are actually tapping individual dispositions toward risk taking, rather than a process of categorization. Kogan and Wallach (1964) discovered that low test anxious - high defensive females preferred a strategy of conceptual conservatism, where broad categorization (on the CWT) was adopted to avoid making errors of exclusion.

> In the absence of information regarding the categories in the Pettigrew task, the conservative subject may decide to 'blanket the field' for there is always the nagging possibility that at least one highly deviant case exists for almost all natural and man-made events (p. 147).

Kogan and Wallach argued that broad categorization for this group of individuals was, in fact, a strategy of uncertainty reduction and that motivational dispositions could be the underlying factors in accounting for such behavior. Their findings offered no support for hypothesizing relationships between category width and risk taking measures for males.

> We may conclude, therefore, that the Pettigrew test taps somewhat different dimensions in the two sexes -- more strictly cognitive in males, more motivational in females. If this is indeed the case, sex differences on the test have little psychological meaning and most certainly do not reflect differential risk-taking proclivities in males and females (p. 150).

Bruner and Tajfel (1961) have been studying the direction of change in breadth of category as related to changes in categorizing conditions. Risk taking implications have been discussed in their

measures of categorization. They feel, however, that investigation of relationships between categorization, motivational and personality dimensions are premature.

> In any case, it seems patent that experiments seeking to relate categorizing breadth either to conditions of judgment or to personality cannot get very far unless and until we understand much more about the intimate texture of the act of categorizing itself. This is not to say that we do not recognize the degree to which categorizing is affected by these two sets of determinants. Rather, we feel an examination of the underlying judgmental processes involved in categorizing is necessary for a fuller understanding of the role played by motivational and personality variables (p. 232).

Tajfel, Richardson, and Everstine (1964) note, however, that Wallach (1962) argues in favor of searching for personality moderator variables as a source point for understanding cognitive styles:

> In his [i.e. Wallach's] view, attempts should be made to separate more distinctly sets of specific variables in the areas of motivation and personality, as these variables are likely to affect the consistency of cognitive styles and thus to reduce the predictive value of the findings (p. 90).

The purpose of the present investigation was to show that (i) extensiveness of scanning and category width were related to given personality dimensions, (ii) extensiveness of scanning and field-articulation could account for part of the variation in category width.

Extensiveness of scanning and category width were interpreted as ambiguous task situations providing minimal cues for decision making. If individuals classified under rigidity-flexibility, anxiety, social defensiveness, and intolerance of ambiguity perceived our experimental conditions as ambiguous, threatening, or involving some degree of risk, then predictions could be made as to direction of their behavior.

Classes of subjects scoring high on rigidity, anxiety, social defensiveness and intolerance of ambiguity should behave in a manner consistent with reduction of uncertainty, ambiguity or risk. Such classes of subjects should score as extensive scanners and narrow categorizers. The results of this study confirmed these assumptions.

Furthermore, if individuals express an ability to impose order and structure on a given stimulus field (high field-articulation), they should be more efficient in terms of time and error on the size estimation task. Partial confirmation for this hypothesis was achieved. High field-articulating males devoted less time centrating on the standard. High field-articulating females made fewer constant errors.

Finally, high field-articulators, because they impose order and structure on a given stimulus field, should be more sensitive to possible variations in the Pettigrew task. Thus, a prediction was made that high field-articulators were also broad categorizers. This was upheld in the female sample only.

The intriguing result of this study was that overall, intercorrelations among cognitive style and personality variables for the male and female samples were not impressive. The majority of these expressed little or no relationship. Regression analyses contributed no new interpretations. But, subgroups of individuals characterized by high-low dichotomized scores along given personality dimensions repeatedly demonstrated significant relationships among variables.

Reports in the literature have consistently shown that on the Pettigrew test males scored as broad categorizers, females as narrow

categorizers. There are, to the writer's knowledge, no reports investigating the Pettigrew test as a source of ambiguity or a task situation involving decision-making in a minimal cue setting. Examination of this test will reveal that most of the items call for factual knowledge of normally remote subject matter to the average individual (e.g., length of whales, tonnage of ships entering a harbor, etc.). Our data indicated that certain classes of individuals, <u>male</u> <u>or</u> <u>female</u>, responded not by peculiarities of categorization attributed to a given sex, but according to personality determinants. High anxious, rigid males were <u>narrower</u> categorizers than the general female sample. High anxious, flexible males were broad categorizers. Low anxious, low defensive females, tolerant of ambiguity were as broad in categorization as the average male. Keeping field-articulation and the remaining personality variables constant, females <u>intolerant</u> of ambiguity were narrow categorizers. High defensive, rigid females were also narrow categorizers.

Thus, it has become apparent that on the basis of data offered here, generalizations previously made as to categorizing style on the Pettigrew task are subject to revision. Some reference must be made to the class of individuals discussed. This study gained no support to indicate that broad categorization was a strategy of uncertainty reduction. In fact, the opposite interpretation is warranted by our evidence. <u>Narrow</u> categorization was an expression of uncertainty reduction by given classes of individuals whether male or female.

A frequent criticism made of cognitive styles (Tyler, 1965; Schroder, <u>et</u> <u>al</u>., 1967) is that these mechanisms are postulated to be

consistent and characteristic of given individuals across all situations, natural or experimental.

> . . . cognitive styles are usually treated as being characteristic of persons regardless of situational characteristics. We have emphasized the importance of situational effects and stress the notion that there is no necessary relationship among the structural levels shown by a person in different stimulus areas (Schroder, *et al*., p. 131).

Bruner and Tajfel (1961), using a different test for categorization have investigated the categorizing process under changing categorizing conditions. Using fifth-grade school children, they have shown that this cognitive style, at least, does change under specified circumstances:

1. Narrow categorizers were more sensitive to changes in the stimulus field.
2. Narrow categorizers changed their breadth of categorization in the direction of the range of stimuli provided. When the range broadened, their equivalence range broadened.
3. The broad categorizers in their study did not change accordingly. They changed only when the range of stimuli provided assumed permanency.

> In sum, reaction to change appears to be a strategy of dealing with the consequences of error. The narrow categorizers appears to prefer the risk of reacting and possibly being wrong. The broad categorizers prefers the risk of not reacting to change and possibly being wrong (Bruner and Tajfel, p. 241).

Comparisons to their studies, while tempting, must be hedged with caution since age of subjects and criterion tests were markedly different. Bruner and Tajfel hypothesized that categorization by some

subjects would be swayed by anchor effects (Tajfel, 1959). Narrow categorizers were shown to shift breadth of categorization according to range of stimuli provided. Another feasible interpretation is that narrow categorizers were also field-dependent or low field-articulators. The reader will recall that low anxious, low field-articulating females in the present study scored as narrow categorizers. In terms of further research, there is reason to believe that narrow categorizing females would shift breadth of category on the CWT in the direction of change of the mean value given in each item of that test. Narrow categorizers would choose <u>not</u> to deviate too far from this referent or "anchor" situated in a central position among the alternatives offered.

Incidentally, Bruner and Tajfel reported an inverse relationship between category width and IQ. Data from our pilot study revealed no correlation between the CWT and a test of scholastic aptitude.

The investigation of cognitive styles, particularly category width, is plagued by great diversity in operational meaning. The distinctions across interpretations of breadth of category find some common thread in that consistencies of categorization are usually reported whether unidimensional or multidimensional tests are used. Thereafter, meanings diverge. One of the more appealing conceptualizations of category width suggests that decisions of categorization are made on the basis of similarity or difference of a stimulus to a target class of stimuli. The earlier object sorting tests (Gardner, <u>et al</u>., 1959; Messick and Kogan, 1963) were of this type. Subsequent test designs have led to an appreciation of the fact that categorization

is subject to many (as yet unspecified) criteria. Different realms of psychological functioning (conceptual, judgmental, perceptual) have become apparent. The effects of personality and motivation as moderator variables have also been pursued. Thus, the problem gains in complexity as more research enters the arena. However, each author continues to refer to cognitive styles as if they were unequivocally interpreted. The longstanding need for clarification in this area has been outlined by Witkin (cf., Scheerer, 1964):

> First of all, there are the important tasks of sharpening the definition of some of the cognitive styles now in vogue and of developing 'marker' tests for their identification. The obvious overlap among some of the styles described in the literature points to the need for 'codification' of cognitive styles. Greater attention needs to be given to the patterning of cognitive styles in individuals, particularly to the effect of different kinds of patterning upon the expression of a given cognitive style and to the characterization of persons, with regard to cognitive style, in multidimensional terms. For many cognitive styles, their connection with personal functioning requires further elucidation (pp. 172-173).

Further research will be required to investigate cognitive styles under cost-related conditions. Most of the reports to date have investigated cognitive styles under cost-free conditions. The value of such research need not be emphasized. Everyday decisions in an individual's natural setting commonly involve some degree of cost, whether emotionally, socially, physically, or financially induced.

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APPENDIX A

TABLE 1a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE: (a) MEAN JUDGMENT TIME PER TRIAL, FOR MALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr.Model	df	F	p	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.19	.06	1/55	8.62	.01	12.67%
Anxiety	.19	.18	1/55	0.55	.46	-
Social Defensiveness	.19	.12	1/55	4.68	.04	6.88%
Intolerance of Ambiguity	.19	.14	1/55	3.83	.06	5.64%

TABLE 2a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE:
(b) MEAN NUMBER OF CENTRATIONS ON STANDARD PER TRIAL, FOR MALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr. Model	df	F	p	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.17	.08	1/55	5.51	.02	8.37%
Anxiety	.17	.16	1/55	.47	.50	-
Social Defensiveness	.17	.07	1/55	6.80	.01	10.29%
Intolerance of Ambiguity	.17	.13	1/55	2.57	.11	3.89%

TABLE 3a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE: (e) MEAN TIME PER CENTRATION PER TRIAL, FOR MALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr. Model	*df*	*F*	*p*	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.10	.09	1/55	.59	.45	-
Anxiety	.10	.03	1/55	3.95	.05	6.48%
Social Defensiveness	.10	.09	1/55	.37	.55	-
Intolerance of Ambiguity	.10	.08	1/55	.84	.36	-

TABLE 4a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE: (a) MEAN JUDGMENT TIME PER TRIAL, FOR FEMALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr.Model	df	F	p	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.06	.05	1/77	.67	.42	-
Anxiety	.06	.01	1/77	3.88	.05	4.76%
Social Defensiveness	.06	.05	1/77	.09	.77	-
Intolerance of Ambiguity	.06	.06	1/77	.00	.95	-

TABLE 5a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE:
(b) MEAN NUMBER OF CENTRATIONS ON STANDARD PER TRIAL, FOR FEMALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr.Model	df	F	p	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.04	.04	1/77	.06	.81	-
Anxiety	.04	.00	1/77	3.09	.08	3.85%
Social Defensiveness	.04	.04	1/77	.14	.71	-
Intolerance of Ambiguity	.04	.04	1/77	.34	.56	-

TABLE 6a

TESTING FOR CONTRIBUTION OF PERSONALITY PREDICTORS TO SCANNING MEASURE:
(e) MEAN TIME PER CENTRATION PER TRIAL, FOR FEMALES

Predictor	RSQ_1 Full Model	RSQ_2 Restr.Model	<u>df</u>	<u>F</u>	<u>p</u>	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.03	.02	1/77	.39	.53	-
Anxiety	.03	.01	1/77	1.27	.26	-
Social Defensiveness	.03	.03	1/77	.08	.77	-
Intolerance of Ambiguity	.03	.03	1/77	.13	.72	-

TABLE 7a

REGRESSION MODELS TESTING FOR INDIVIDUAL CONTRIBUTIONS OF PREDICTOR VARIABLES TO VARIANCE OF CATEGORY WIDTH FOR MALES

Personality Predictors	RSQ_1 Full Model	RSQ_2 Restr.Model	*df*	*F*	*p*	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.10	.06	1/54	1.92	.17	-
Anxiety	.10	.06	1/54	2.22	.14	-
Social Defensiveness	.10	.09	1/54	.34	.56	-
Intolerance of Ambiguity	.10	.10	1/54	.00	.98	-
Field-Articulation	.10	.08	1/54	.73	.40	-

TABLE 8a

REGRESSION MODELS TESTING FOR INDIVIDUAL CONTRIBUTIONS OF PREDICTOR VARIABLES TO VARIANCE OF CATEGORY WIDTH FOR FEMALES

Personality Predictors	RSQ_1 Full Model	RSQ_2 Restr.Model	df	F	p	Percentage contribution of Predictor to Criterion
Rigidity-Flexibility	.14	.13	1/76	.42	.52	-
Anxiety	.14	.13	1/76	.45	.50	-
Social Defensiveness	.14	.11	1/76	2.27	.14	-
Intolerance of Ambiguity	.14	.10	1/76	2.23	.08	3.66%
Field-Articulation	.14	.11	1/76	2.12	.15	-

TABLE 9a

TESTING FOR SEX INTERACTION OF PREDICTORS TO CATEGORY WIDTH

Personality Predictors	RSQ_1 Full Model	RSQ_2 Restr.Model	*df*	*F*	*p*	Percentage Contribution of Predictor to Criterion
Rigidity-Flexibility	.27	.27	1/134	.15	.70	-
Anxiety	.28	.27	1/134	2.64	.11	-
Social Defensiveness	.27	.27	1/134	.55	.46	-
Intolerance of Ambiguity	.27	.27	1/134	.35	.55	-
Field-Articulation	.27	.27	1/134	.14	.71	-

TABLE 10a

REGRESSION MODELS TESTING FOR CONTRIBUTION OF VARIANCE OF SCANNING PREDICTORS TO VARIANCE OF CATEGORY WIDTH FOR DICHOTOMIZED GROUPS OF SUBJECTS*

Group	Scanning Predictor	RSQ_1 Full Model	RSQ_2 Restr. Model	df	F	p	Percentage Contribution of Predictor to Criterion
High Anxious Males	(a)	.36	.12	1/21	7.71	.01	23.65%
	(c)	.36	.16	1/21	6.44	.02	19.76%
High Social Defensive Females	(d)	.27	.14	1/30	5.26	.03	12.88%
Low Social Defensive Males	(c)	.23	.08	1/22	4.52	.04	15.76%
High Intolerance of Ambiguity Males	(a)	.31	.11	1/23	6.52	.02	19.65%
	(b)	.31	.15	1/23	5.27	.03	15.89%

* Only $p \leq .05$ reported.

APPENDIX B

TABLE 1b

RAW DATA CODE

Column

1. Subject Number
2. Sex
3. Category Width
4. Rigidity-Flexibility
5. Anxiety
6. Social Defensiveness
7. Intolerance of Ambiguity
8. Field-Articulation
9. (a) Mean Judgment Time per Trial
10. (b) Mean Number of Centrations on Standard
11. (c) Mean Total Centration Time on Standard
12. (d) Mean Percentage of Time on Standard
13. (e) Mean Time per Centration
14. (f) Mean Constant Error per Trial
15. (g) Total Constant Error over Twelve Trials
16. Age

TABLE 1b

RAW DATA

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1	F	52	109	17	12	46	2	17.6	2.0	2.1	11.1	1.0	4.2	51.0	19
2	M	93	116	19	18	49	14	9.0	2.9	2.3	25.7	0.7	1.9	23.0	26
3	F	55	105	13	14	49	16	7.6	2.2	1.2	16.9	0.5	1.2	15.5	18
4	M	71	105	12	14	48	7	11.6	2.0	4.4	33.2	2.2	3.1	38.0	18
5	M	54	86	7	25	39	13	4.9	1.0	0.5	11.5	0.5	2.8	34.0	20
6	M	75	100	9	17	59	13	10.5	1.2	2.2	20.8	1.8	1.5	19.0	23
7	F	71	105	25	17	62	8	24.7	2.6	8.2	31.7	3.0	2.2	27.5	23
8	F	65	94	14	24	39	11	17.0	5.4	4.0	23.9	0.7	1.4	17.0	19
9	F	57	80	20	6	64	6	5.9	1.5	1.0	17.6	0.6	8.0	96.5	33
10	F	65	96	33	4	47	12	11.7	4.0	4.3	36.9	1.0	8.3	100.0	21
11	F	73	115	19	13	49	15	5.5	2.3	1.2	21.9	0.5	1.8	22.5	18
12	F	49	105	18	17	50	12	19.4	2.9	3.6	17.6	1.2	1.6	19.5	19
13	M	62	80	10	10	61	13	16.2	1.5	2.0	12.1	1.3	3.7	45.0	18
14	M	89	121	19	5	44	19	17.6	1.6	4.5	21.2	2.7	5.2	62.5	45
15	F	64	119	12	23	52	14	12.8	2.0	2.6	19.0	1.3	4.7	56.5	42
16	F	66	107	19	9	60	21	24.5	2.9	7.6	30.7	2.6	1.8	22.5	19
17	M	83	80	5	11	45	16	9.3	3.0	2.2	22.8	0.7	3.0	36.0	21
18	M	59	109	23	14	60	9	26.4	2.3	10.3	37.5	4.4	2.5	30.5	31
19	F	60	123	22	13	36	11	18.0	5.0	3.8	17.1	0.7	10.0	120.5	20
20	F	67	92	23	17	64	11	6.9	2.3	1.2	17.5	0.5	2.1	26.0	19

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
21	F	62	97	25	14	80	12	10.3	4.0	2.8	28.1	0.7	4.6	56.0	37
22	F	53	109	8	20	46	16	9.9	3.9	2.3	23.1	0.5	2.1	26.0	18
23	M	55	82	18	20	58	9	14.3	3.5	6.0	43.6	1.6	1.0	12.5	18
24	F	56	117	12	12	37	12	5.4	1.2	0.9	16.9	0.7	2.5	30.5	19
25	F	49	98	11	5	56	16	23.5	2.0	6.5	27.7	3.1	3.9	47.5	18
26	F	61	82	28	12	52	13	30.0	1.1	7.6	28.2	6.5	2.8	34.0	23
27	F	62	100	7	11	51	5	17.6	5.5	4.7	26.7	0.8	3.1	38.0	42
28	M	75	98	4	22	37	8	8.8	3.9	2.4	27.2	0.6	2.7	33.5	23
29	F	55	94	24	16	53	11	32.7	9.4	12.4	36.9	1.3	2.1	25.5	23
30	F	38	98	10	15	51	10	7.1	2.3	1.1	15.9	0.4	2.4	29.0	19
31	M	77	94	13	21	57	7	25.7	2.5	9.3	35.5	3.7	10.4	125.0	27
32	F	62	82	29	21	55	13	21.3	3.3	5.7	24.5	1.7	1.6	19.5	22
33	F	69	136	9	17	33	23	11.1	1.4	0.8	8.1	0.6	1.2	15.5	17
34	F	78	92	24	12	45	11	14.7	4.0	4.0	27.0	1.0	4.3	52.0	27
35	M	76	86	8	12	49	4	3.5	1.9	0.8	23.2	0.4	1.0	12.0	20
36	M	98	123	4	16	42	2	29.5	6.0	9.7	32.9	1.5	1.6	19.5	19
37	M	87	100	23	14	56	20	25.9	1.6	5.4	17.6	3.2	4.4	53.0	19
38	M	73	125	13	4	36	11	4.8	0.5	0.6	11.3	1.3	5.7	68.5	18
39	F	48	115	17	17	54	6	10.8	2.0	3.7	34.6	1.8	3.2	38.5	19
40	M	67	123	24	13	54	3	9.5	2.5	2.7	8.2	1.0	4.5	54.7	19
41.	M	64	80	28	20	45	28	4.4	3.0	1.1	24.6	0.3	3.4	41.5	20

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
42	M	76	105	10	18	41	19	5.1	2.3	1.0	21.8	0.4	2.0	24.5	25
43	F	65	107	37	13	65	5	23.3	2.4	8.7	37.9	3.6	3.4	41.0	18
44	M	54	119	12	2	58	14	9.0	3.5	3.1	34.1	0.8	2.2	26.5	18
45	F	47	83	13	24	68	17	6.2	2.0	1.6	25.4	0.8	1.4	17.5	26
46	M	64	97	25	15	52	12	5.9	2.8	1.4	24.8	0.5	1.8	22.0	39
47	F	59	84	17	16	44	5	14.3	3.6	5.0	36.1	1.3	3.5	43.0	19
48	M	83	96	9	12	62	15	18.3	4.0	5.1	28.0	1.2	1.2	15.5	23
49	M	86	100	8	14	56	18	16.1	1.9	2.4	15.4	1.2	1.1	14.0	22
50	F	47	86	21	8	67	15	12.8	3.0	3.3	26.2	1.1	4.7	56.5	19
51	M	78	109	6	4	47	12	27.5	4.7	7.5	26.3	1.5	3.2	39.5	20
52	M	79	121	6	21	50	18	35.6	5.1	6.6	19.5	1.2	2.0	24.0	21
53	M	85	119	20	22	55	9	47.2	13.2	11.0	23.2	0.8	1.6	19.5	19
54	F	38	105	15	19	40	18	8.6	2.2	2.2	25.0	0.9	2.2	27.5	18
55	M	90	92	9	6	42	22	6.8	0.9	0.7	11.0	0.8	1.3	16.0	32
56	F	77	98	14	19	57	21	10.2	3.7	3.2	32.5	0.8	2.5	30.0	29
57	F	79	111	21	14	51	14	5.9	2.3	1.6	29.1	0.7	1.5	19.0	19
58	F	78	136	14	21	38	12	31.7	2.6	11.7	35.5	4.4	1.0	12.5	22
59	F	40	92	12	19	51	7	10.6	1.9	2.1	19.5	1.1	1.3	16.0	19
60	F	55	84	18	18	63	15	16.5	3.2	3.0	18.3	0.9	6.0	73.0	17
61	M	82	111	17	9	64	5	5.1	1.0	1.1	23.6	1.0	5.1	61.5	36
62	M	77	123	9	16	46	12	20.3	1.9	4.1	20.3	2.1	5.5	67.0	19

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16
63	F	69	94	11	24	56	15	15.9	2.5	4.4	23.3	1.7	2.8	34.0	18
64	F	66	100	13	17	59	6	9.0	2.8	1.9	21.8	0.6	5.1	61.5	19
65	F	11	78	30	20	70	13	5.8	2.3	2.1	33.7	0.9	4.6	55.5	19
66	F	55	94	21	19	51	5	33.2	2.7	7.2	20.7	2.6	3.9	47.0	18
67	F	44	84	24	21	39	19	5.5	1.6	1.2	21.8	0.7	6.1	74.0	18
68	F	67	84	27	23	55	15	24.2	4.6	6.7	27.4	1.4	2.6	12.5	19
69	F	55	56	14	25	49	12	6.1	2.0	1.3	21.8	0.6	3.3	40.0	19
70	F	40	103	23	15	48	8	7.3	2.1	1.8	25.2	0.8	1.9	23.5	27
71	M	57	70	14	15	42	7	7.4	1.7	1.2	16.9	0.6	4.7	57.5	20
72	M	60	123	10	15	39	8	17.4	2.6	5.2	30.5	1.9	2.2	27.0	18
73	F	70	88	25	17	62	24	19.7	5.0	5.0	22.9	0.9	1.5	18.0	18
74	M	103	90	5	19	53	16	22.4	3.4	9.1	42.0	2.6	1.4	17.0	27
75	F	45	107	33	13	55	10	13.4	4.2	2.7	19.9	0.6	2.0	24.5	19
76	F	59	92	23	18	69	13	4.8	1.0	0.5	9.7	0.5	2.4	29.5	20
77	F	37	80	21	20	71	6	8.5	1.5	1.2	14.1	0.8	4.2	51.0	19
78	F	74	96	15	13	47	8	10.7	2.6	2.8	25.8	1.0	2.0	24.0	19
79	F	88	86	21	12	54	3	13.7	2.8	5.3	39.6	1.8	3.7	44.5	18
80	M	69	108	20	16	51	9	23.9	4.2	8.5	32.0	2.0	2.0	24.5	30
81	F	82	92	15	11	44	14	10.3	2.7	3.1	29.9	1.1	1.3	16.0	18
82	F	70	76	18	14	44	4	7.7	1.1	1.4	19.2	1.2	3.8	46.0	45

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
83	M	41	107	13	9	51	13	20.9	2.4	7.0	33.5	2.9	5.2	62.5	18
84	M	75	84	15	20	54	24	7.9	2.0	1.6	20.3	0.7	1.0	12.5	31
85	F	76	96	16	15	36	13	15.8	2.5	4.9	30.3	1.9	1.1	14.0	19
86	F	19	80	11	25	62	8	16.1	3.4	2.8	17.7	0.8	1.2	15.0	18
87	F	30	84	20	18	51	8	11.5	2.3	2.0	18.0	0.8	5.5	66.5	18
88	F	66	115	23	12	52	7	2.7	5.5	6.3	23.9	1.1	5.0	61.0	20
89	F	85	73	35	13	42	13	7.0	2.1	2.5	37.3	1.1	1.2	15.5	18
90	M	61	88	15	7	53	8	7.5	2.5	2.0	27.0	0.8	3.9	47.0	18
91	F	51	98	12	25	45	12	13.5	3.3	4.1	29.4	1.2	3.5	42.0	18
92	F	63	105	18	16	58	9	8.0	1.3	1.7	23.7	1.3	2.2	26.5	18
93	F	40	98	24	15	68	15	28.4	3.1	6.2	21.3	1.9	2.3	28.0	19
94	F	60	98	12	23	68	16	32.2	3.6	10.9	33.2	2.9	5.1	61.5	18
95	F	76	100	20	8	53	21	21.2	1.6	4.6	20.5	2.7	3.4	41.5	23
96	M	81	119	18	13	57	12	13.9	2.3	2.8	19.9	1.2	4.2	51.0	42
97	F	44	94	28	15	48	15	26.1	4.0	7.5	27.6	1.8	2.1	26.0	18
98	M	76	86	8	18	61	7	17.5	3.4	2.3	14.0	0.6	8.7	105.5	33
99	F	74	107	24	10	42	7	21.4	4.3	4.4	20.5	1.0	6.2	75.0	18
100	M	42	84	17	12	66	14	10.1	2.3	1.5	15.3	0.6	1.9	23.0	34
101	M	74	92	22	8	45	10	8.0	1.3	1.0	11.7	0.7	6.3	47.0	30
102	M	76	90	15	16	62	7	27.6	5.3	8.4	29.0	1.5	6.3	76.5	19

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
103	M	89	94	9	11	48	13	12.2	1.7	3.4	29.2	1.9	3.8	46.5	24
104	F	32	102	27	20	47	14	25.1	2.4	6.6	26.4	2.7	3.7	45.5	51
105	M	62	98	12	19	59	11	33.2	7.4	11.4	33.0	1.5	1.8	22.0	19
106	F	57	78	21	20	72	7	23.6	3.1	6.1	21.3	1.9	6.9	83.0	18
107	M	90	101	15	5	57	11	6.6	2.3	1.9	30.0	0.8	1.1	14.0	37
108	F	57	83	11	22	56	6	7.2	3.2	1.7	23.7	0.5	1.2	15.5	53
109	F	81	86	25	14	54	8	30.8	2.4	7.0	23.7	2.9	3.3	40.5	20
110	F	77	105	26	16	51	21	21.1	6.0	6.7	28.2	1.1	3.9	47.5	18
111	M	72	121	10	9	40	17	4.6	0.5	0.3	4.3	0.6	5.5	66.5	19
112	M	77	92	8	20	47	13	4.9	0.4	0.2	4.6	0.5	4.0	49.0	32
113	F	64	76	35	21	63	12	12.1	2.8	2.6	21.4	0.9	1.3	16.5	19
114	F	71	113	31	12	52	12	8.6	1.5	1.5	17.4	0.9	2.6	32.0	19
115	F	49	117	17	8	48	7	6.5	2.4	1.7	28.1	0.7	1.7	21.0	21
116	M	79	108	14	8	64	10	6.8	1.1	1.3	20.9	1.1	1.6	20.0	42
117	F	68	94	13	13	38	16	17.6	3.0	4.4	24.0	1.4	1.2	14.5	19
118	F	58	94	32	9	48	17	32.2	7.0	9.0	28.2	1.2	2.0	24.5	18
119	M	86	119	3	21	43	22	8.5	2.6	1.9	23.6	0.7	6.5	79.0	23
120	M	61	117	10	13	58	9	12.2	5.2	3.3	27.5	0.6	2.6	32.0	19
121	M	97	103	14	13	32	9	11.6	1.4	1.5	10.8	1.0	4.0	48.0	27
122	M	81	103	19	11	54	13	24.4	5.8	6.0	24.3	1.0	1.5	18.0	19

CONTINUED

TABLE 1b - RAW DATA (CONTINUED)

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
123	F	42	92	16	6	53	1	9.2	2.3	2.0	22.2	0.8	4.7	56.5	20
124	M	81	108	24	9	46	13	11.9	3.5	3.9	32.4	1.1	2.7	32.5	28
125	M	115	109	21	9	61	9	25.4	2.7	5.8	22.9	2.1	1.7	20.5	18
126	M	47	105	26	8	38	11	29.2	4.3	10.5	35.3	2.4	2.5	31.0	19
127	F	66	96	22	15	35	22	17.9	3.0	3.5	20.4	1.1	2.4	29.0	19
128	F	46	113	34	13	60	10	13.8	1.5	2.0	14.9	1.3	1.2	15.0	19
129	F	65	86	15	16	51	20	24.0	2.0	5.7	23.2	2.7	3.5	42.5	24
130	F	61	98	22	13	45	14	12.1	2.9	5.7	45.1	1.9	1.7	20.5	18
131	M	63	82	10	28	44	15	8.4	1.1	0.9	10.6	0.7	0.8	10.0	20
132	F	49	69	27	14	63	9	15.4	3.0	3.5	23.2	1.1	3.3	40.0	18
133	M	94	91	26	8	59	17	14.9	1.9	4.0	27.1	2.1	1.3	16.0	39
134	M	43	94	25	19	61	15	10.2	1.6	2.9	28.7	1.7	3.7	45.5	19
135	F	64	82	5	25	51	13	10.9	1.9	2.4	22.8	1.3	2.5	30.0	23
136	M	97	100	14	17	42	15	17.5	2.5	5.4	29.2	2.1	2.4	29.0	20
137	M	67	121	21	13	45	11	27.2	4.1	8.0	29.5	1.9	1.9	23.0	20
138	M	63	69	25	23	53	7	21.8	4.4	7.3	34.0	1.6	5.2	63.5	19
139	M	60	94	17	17	51	19	10.6	4.7	3.0	28.1	0.6	2.0	24.5	34
140	F	77	115	20	8	54	15	26.7	3.0	6.5	22.7	2.1	1.3	16.0	17
141	F	82	121	30	20	46	14	20.6	3.9	3.3	14.9	0.8	1.7	21.5	18
142	F	47	111	13	25	50	3	5.2	1.5	2.2	21.5	1.4	4.0	48.0	18